ELECTRICAL WORLD

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ELECTRICAL WORLD

MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION
PUBLISHED EVERY OTHER SATURDAY

JANUARY 5, 1935

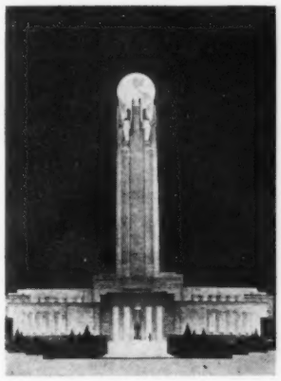
A Good Year for Electrical Men

A NEW YEAR opens for the electrical industry that has vast possibilities for recovery and progress. In fact, so far as load is concerned the depression is over for the power companies. The curve has risen near the high point of their history. There are more customers connected to the lines today than ever before. And customers make the market. Politically, the skies are not so clear. The government demands that the charge for electricity be reduced and threatens a destructive competition. But already the corrective process has set in.

The charge for electric service today is expressed in a price per kilowatt-hour of energy. But it is really not the cost of producing electricity but the cost of serving customers that determines the rate. Kilowatt-hours are very cheap, but it is very expensive to deliver them to the average domestic consumer because he uses so little. The answer, therefore, is to increase the use of the service so that the average customer will pay a larger bill. Then the price of kilowatt-hours can come down. And that is just what's happening.

The power industry is now facing the situation with fortitude. Rates are rapidly being reduced across the country. Sales activities are being intensified, so that by the development of a better load factor through a larger use of electric refrigerators, ranges, water heaters, ironers and air conditioning the average revenue from domestic consumers will increase and make still further rate reductions possible.

The utilities are now headed for better times and a new prosperity based on a much greater volume of business. To create this greater market will call for a vast production of domestic appliances, lighting equipment and wiring materials. To serve it will require large purchases of apparatus and equipment for the expansion of systems. And in the manufacture and distribution and installation of all these products the entire electrical industry will share and prosper.



The electrification of America can well be the "reviving force for restoring prosperity," as President Roosevelt has reiterated. But private industry has the resources and ability not only to re-create the prosperity but to bring about the social, commercial, industrial and financial benefits which he has cited. It will bring immediate stimulus to the durable-goods industries, in which nearly 60 per cent of the unemployed were formerly engaged. For it has been estimated that to provide all the 22,000,000 homes in this country with complete electrical equipment would create around $18,000,000,000 in business volume. To wire and equip the 6,289,000 farms up to a modern standard would put another $3,900,000,000 in circulation.

BE THAT as it may—discount the totals as you will—no man doubts the great undeveloped possibilities of electrification. The social and economic advantages of such a continuing progress stand out clear. And the American people are eager to enjoy them.

Power companies are facing the future courageously and meeting the demands of the changing times. They are ready to build this broader service that the public wants. It is only this political uncertainty that holds them back. Therefore, we should have a clear statement from Washington as to the policy which the Administration intends to follow so that there need be no more delay in waiting. The important thing, the vital need, is to start the wheels of the durable-goods industries turning and increase employment and purchasing power. Electrical men will make a tremendous contribution in this direction as soon as the way is clear.

THE ROAD TO RECOVERY

WIDER APPLICATION OF TRIED AND PROVEN ELECTRICAL USES:

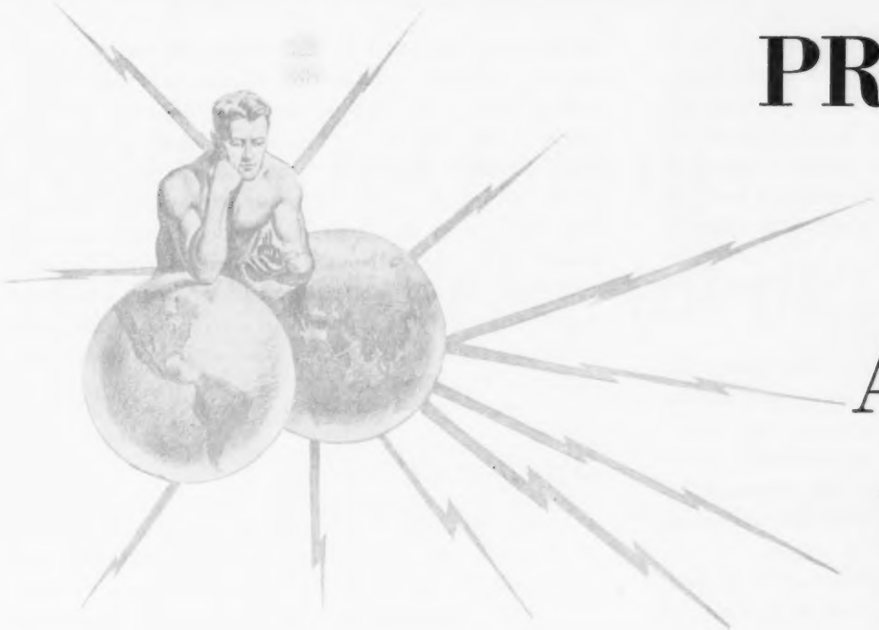
• Will raise standards of living and working conditions • Effect economies in all business and industrial activities • Stimulate production of capital and consumer goods • Increase employment in most badly stricken fields • Create purchasing power to aid general business

• Sales during 1934: Utilities—energy, $1,830,000,000; electrical manufacturers—$700,000,000

COMPLETE ELECTRIFICATION

• Will raise this total to $25,500,000,000 • Revitalize the now-stagnant durable-goods industries • Restore jobs to 60 per cent of the unemployed • Circulate millions in wages through business channels • Stabilize financial situation and release frightened dollars.

DEMANDS TEAMWORK IN AGGRESSIVE SELLING



PROGRESS

All Along the Line

General Improvement in 1934

Whatever index is taken as a measure of the progress in the electrical industry in 1934 shows an improvement in general status. Utility energy sales increased 7.2 per cent and gross revenue 3.2 per cent. Electrical manufactures had a business increase of about 27 per cent. Despite increased costs the manufacturers showed an improvement in earnings. Utilities, however, had an increase of 7.9 per cent in operating expenses and added taxes, and net revenue increased slightly, if at all. With a continued up-turn in business and with no added costs the industry can look forward to a steadily improved earnings position this year.

Spending for Recovery

Nearly $300,000,000 will be spent by the utilities for expansion, maintenance and replacement in 1935. This is necessity spending based upon minimum estimates and will be exceeded if business continues to improve. This sum will have a great influence upon employment and the recovery of prosperity. We wonder, however, what sum would be spent if the political skies were clear and the credit position more favorable?

Where the Shoe Pinches

Sooner or later the public will find out the facts about the utility business. One of these is that a holding company is not really a public utility and that the present holding company has changed its status and organization appreciably. The other is the conception that the top domestic rate should be the center of attack and be reduced. This rate is for the millions of customers served at a loss. The inducement parts of rates encourage use and give low rates to those who will use energy. Nearly every operating utility has a very low rate for those who really use energy. The public will understand how to distinguish between its relations as customers and as investors and will acquire some fundamental knowledge of the economics of electric power supply. This will be one plus value of the present agitation.

Look at the Record

In about 25 years the utilities have invested about $13,000,000,000 in operating facilities and accomplished a national electrification that has been the envy and admiration of all other nations. What has this meant? In terms of power only, the utilities have saved the nation at least a billion dollars a year in costs. In domestic and other sales undoubtedly an equally large dollar figure can be added to the intangible benefits. This industry has saved the nation many times what the nation has paid it for power.

Investment and Rates Status

In 1927 the average investment in utility systems was $368 per kilowatt of generating capacity and the average rate at which energy was sold was 2.72 cents per kilowatt-hour. In 1934 the unit investment had increased to $383 per kilowatt because of overbuilding at the request of government to check the depression in 1929, yet the average price of energy sold had decreased to 2.59 cents per kilowatt-hour. Back in 1912 the unit investment was as high as $410 and the average price for energy was 3.36 cents per kilowatt-hour.

That was when the domestic customer was using only 264 kilowatt-hours a year and paying 8.7 cents for each unit. Today he pays an average of 5.30 cents, which is 39 per cent less per unit, and thus gets 238 per cent as much to use for only 46 per cent more dollars per month or per year. This in the face of the fact that

the investment made for him and all customers is only 8 per cent less than 22 years ago. Price levels in the interim have gone up along with the 36 per cent increase in the general cost of living, but in spite of all these relatively adverse factors the industry has cultivated generation efficiencies and load building simultaneously to afford bases for steady reduction in charges.

More Output per Unit

A still more significant index of the downward trends in rates is the increase in output per unit of installed capacity. Consistently the industry has striven to make each kilowatt of capacity work more hours—something that could only happen if new customer demands were created, were inspired and then delivered. Between 1912 and 1929 each kilowatt of capacity was loaded to turn out 37 per cent more kilowatt-hours each year. That is the same as saying that those kinds of load had been assiduously cultivated, which meant business for the generators for 840 more hours each year. That is almost exactly five weeks more of employment per year. Unemployment in the generating plants has meant an idleness of the generators for 580 more hours per year in 1934 than in 1929. Three and one-half of those five weeks of working time added laboriously by load building during the 1912-1929 period have been lost during the depression period. About two days per year of increased working time has been recovered during the past year. One factor that permits some of the rate reductions steadily being made is this one of getting the new kilowatt-hours out of generators and other system facilities not now working up to full capacity in either hours or kilowatts.

After One Pound of Coal

In 1917 the industry was burning 3.73 pounds of coal (disregarding the aid of water power) to obtain each kilowatt-hour of total generation; the 1912 figures are not available. By 1934 the industry was burning only one-third as much coal for each unit, what with the help of much higher plant efficiencies and the aid of 9,000,000 additional horsepower in hydro plants. The nation-wide average per kilowatt-hour is now substantially less than the 1.47 pounds of coal computed for 1933, a figure only 44 per cent of the 1917 figure. Of course there are many plants now using close to only one pound per kilowatt-hour under favorable conditions of loading.

Plan Now and Buy Now

It takes two years to plan and erect a station. The year 1935 before it ends should see the resumption of system expansion. If even half the plans now being worked out for intensive load cultivation are put into successful operation the justification for this modest estimate will certainly be established by the projected results. Efforts at alienation of the affection of the public from its electric utilities has continued without much let-up. In spite of that pernicious proselyting and in spite of limited promotional activity of the industry during the last two or three years, the industry has experienced an irrepressible urge toward national electrification that will not be downed. Cultivating this and gratifying it is going to be the industry's answer, and it will surely be reflected in a record for 1935 that will make the 1934 recovery, good as it has been, look very mild by comparison.

Balance in Selling

Naturally enough the sales planning of most utilities is right now focussed on the home. But there are other markets. Stores and offices are suffering as much from deferred maintenance as factories right now. Both light and labor-saving appliances need checking up. This will not be overlooked by the power company that is working on a balanced sales program. But outside of the relatively few dealers, there are unfortunately not many companies with a really comprehensive plan that embraces all markets and is backed with enough man-power to work all fields at the same time. Yet all offer load and profits. This weakness in the industry selling should be faced and corrected in the 1935 planning.

Those Non-Profit Customers

A good fisherman changes his bait when the fish don't rise. Good salesmen do the same thing. It may be, therefore, that the whole past approach of the electrical industry to the minimum bill customer has been wrong and ought to be changed. The evidence is that there are still so many of them. It might be smart for the power companies to devise a variety of special inducement offers for minimum bill customers and try them out for a period of months in a variety of towns and perhaps solve the problem by the research method. Rent the chest type refrigerator. Rent the combinations of small appliances. Try flat rates that include certain equipment installed on rental. Something effective might come out of it and find the answer to the problem.

Plan of Action

Utilities must stop being afraid of shadows and artificial yardsticks. They must speed up their program and do in two or three years what they would normally do in five or six. Rates must make full-use electric homes possible and these homes must be sold. Misleading and false statements must be faced with facts. Unfair competition must be met by legal actions. A complete and constructive program in policy and action by a united industry will get results.

Utility Operations Give Encouragement

Growth of Load Promises to Continue—Political Outlook Improves—Financial Situation Fair—Aggressive Commercial Efforts Under Way

By **THOMAS N. McCARTER**
President Edison Electric Institute

MORE than ample light and power service is at the disposal of American industry and serves 20,000,000 homes with their millions of lights and appliances. Year after year the industry has grown and expanded, at the same time decreasing the cost of its service and improving its quality. Under private enterprise it has produced results in the electrification of this country that cannot be matched in any other nation. It pays in taxes a sum about equal to the wages paid its 275,000 employees. Yet it charges very reasonably for its services; for example, the cost to home dwellers is practically the same as they pay for cigarettes, and only a fraction more than they pay for gasoline taxes.

This human achievement in the public service cannot be evaluated in terms of facts and statistics. It is an accomplishment beyond the dreams of any pioneer or statesman that looked to the future fifty years ago.

Yet with this record the industry is not content. It is going forward on all fronts to improve upon past accomplishments. Despite political agitation, discriminatory taxation, unfair competition and many other trials the industry has courage to go forward and is confident that by its acts it will merit and receive the approval of the public it serves. Both the facts about the business now available at the beginning of a new year and the policies that are being applied by industry executives sustain and renew a firm belief in the continued success of the light and power companies.

The balance sheets of the industry for 1934 are quite encouraging as compared to those of 1933. Energy sales increased from 65,754,000,000 kw.-hr. to an estimated 70,500,000,000, a gain of 7.2 per cent. Gross revenue increased from $1,773,416,000 to $1,830,000,000 according to estimates. giving a gain of about 3 per cent. Increased operating costs and taxes, however, have offset a large part of this increased business so that net revenues have not increased appreciably. Taxes are now taking about 14 per cent of the gross revenue of the industry and are still mounting.

The credit position of the utilities has held up well despite the attacks of agitators and the growth of federal competition. During the year the industry refunded $131,175,000 of obligations on reasonable terms and expects to meet the $127,981,570 of maturities due in 1935. It speaks well for the industry that large institutional investors are favorably disposed toward sound utility securities and it appears evident that private sales to these groups will predominate in utility financing during the coming year.

Operating expenses increased from $795,811,000 in 1933 to an estimated $858,000,000 for 1934. Holding down these expenses in the face of increased taxes, rising prices and added NRA costs is a splendid managerial achievement. Utility executives have not neglected to maintain their properties in condition to care for the expanding demands for electric service and, with the present growth in load, increased expenditures will be necessary in the coming months.

All markets are being cultivated and especial emphasis is being placed upon the development of home electrification. Energy sales to homes increased 6.8 per cent in 1934, the gross revenue 2.7 per cent and the load-building branches of the industry are planning to continue the utmost cultivation of this market. The industry has co-operated wholeheartedly with appliance and lighting sales agencies to bring electric comforts and conveniences to the homes. This work will continue on an even larger scale this year.

From the point of view of business the outlook is favorable. It is only in the realm of politics and legislation that problems confront the industry, and even here the outlook is fair. The further extension of federal "yardsticks" is problematical and it is possible the courts will more clearly define fair and unfair practices with respect to the development of the present projects. Also, the burden of taxation should not be increased, for it is apparent that additional taxes will force increased rates, and no one desires this to happen. The industry is protecting its legitimate interests by every ethical means available.

Utility Executives Expect

Better Business in Detroit

By ALEX DOW
President Detroit Edison Company

BUSINESS prospects in this territory are better, notably in respect to production and sale of automobiles. There is also a most helpful local reaction because of the successful execution of a plan for paying in full the deposits of 600,000 small depositors in banks which have been closed. Further expectations of greater liquidating values of these banks are also encouraging. All should recognize that the bank difficulties which came in 1933 have hurt Detroit more than did the national effects of the depression. The present and prospective reaction is hopeful. Our district is not out of the woods yet, but it sees better going on the trail ahead.

Alex Dow

Fine Domestic and Commercial Prospects

By J. F. OWENS
President
Oklahoma Gas & Electric Company,
Oklahoma City

THE general trend in business in this region appears to be upward. In so far as data are available, it appears that Oklahoma business is equal to or better than the average for the district. How much of this may be due to government spending and how long it must continue to sustain this improvement are not known. Our own business has increased slightly in volume over last year. Residential business has consistently increased throughout the depression, due to aggressive promotional efforts splendidly aided by merchants.

By aggressive campaigns which will feature lighting, air conditioning, cooking and mechanical refrigeration, we estimate that average domestic consumption can be increased about 10 per cent by the end of 1935, lowering the annual return per residential kilowatt-hour about 5 per cent.

Air conditioning in commercial buildings offers a great opportunity. Last year was our first big year in this respect; 1935 should more than double the air-conditioning load.

There is very little likelihood of any great increase in industrial load in 1935 as it depends largely on production, transportation or refining of oil.

J. F. Owens

W. C. Mullendore

In the coming session of the legislature proponents of municipal ownership will make an effort to have a constitutional amendment submitted permitting municipalities to issue revenue bonds for the purpose of erecting municipal power plants and other utilities. Attempts in the last two legislatures were without success. The last legislature imposed a 1 per cent sales tax on practically all products, including electric current. This will probably be increased, but I do not look for any discriminatory legislation. If taxes, which now approximate 15 cents out of every gross dollar, continue to increase, obviously rates cannot continue to decrease normally, much as we would desire.

Optimistic in California

By W. C. MULLENDORE
Executive Vice-President
Southern California Edison Company

MEASURED by activity in retail trade increase of bank reserves and higher prices for agricultural products, as well as increased activity in other fields, business conditions in this territory show improvement over a year ago. There are encouraging signs of a reviving confidence in prospects for 1935 in many lines of business. Our gross sales of electric energy, particularly to domestic and agricultural consumers, have been greater the past year than the year before, due in part to a more intensive sales effort and in part to improved purchasing power of customers. Because of voluntary rate reductions, increased taxes and fuel bills, however, our net earnings are slightly under the previous year. We plan on a continuance of intensive sales effort as well as continuance of the policy of offering lower rates for increased consumption, and prospects are that further increase in demand will be realized in 1935. The growth of demand for industrial power which has lagged behind other classifications this year gives promise of being improved by a revival of building and will be accelerated by removal of uncertainties as to monetary and tax policies, labor conditions and similar questions affecting risks of doing business in the ensuing year.

Consumption Stimulated by Pacific Gas

By P. M. DOWNING
Vice-President
Pacific Gas & Electric Company

DURING the year 1934 the gas and electric utilities of California bent their energies to the task of stimulating consumption of their products.

Better Business in 1935

Voluntary modifications of electric and gas rate schedules were made, all of a promotional character, in that they were designed to increase consumption at the least possible cost to the consumer. Pacific Gas & Electric Company, for instance, gave its agricultural consumers a reduction of 50 per cent upon all electric energy used during a certain period of three months of 1934 in excess of what they had used during the corresponding period in 1933. The result was a substantial increase of consumption. This 50 per cent rate reduction upon excess consumption has been extended to all domestic lighting, heating and cooking consumers and all commercial lighting consumers throughout the entire consolidated system.

This new concession is being offered as an additional measure of co-operation with the federal housing act authorities and should stimulate the purchase of electrical appliances under the government loan plan, resulting in additional payrolls for manufacturers, dealers and others. Business conditions in the Pacific Gas & Electric Company's territory showed signs of improvement during the latter part of 1934 and further improvement is looked for in 1935.

Output Up 7.7%, Revenue 4.5 per Cent

By E. W. LLOYD
Vice-President
Commonwealth Edison Company

THE amount of electricity used by large industrial institutions is a very good index of business conditions so far as manufacturing is concerned. In Chicago during the first ten months of 1934 we find a 5½ per cent increase compared with the same period of 1933, with practically no change in the number of customers. Revenue from our residential customers shows an increase in the same period of 5.4 per cent over that of a year ago, with an increase of 1½ per cent in the number of customers. Large commercial customers have increased their use during 1934 by 2½ per cent. We believe retail business improvement has been somewhat better than our income increase indicates. While the increase in kilowatt-hours of electricity sold was up 7.7 per cent, our income was increased by only 4.5 per cent, due in part to a reduction in industrial rates.

B. I. Budd

P. M. Downing

E. W. Lloyd

In our judgment, the best immediate opportunity to increase our business is through stimulating the wider use of our service by commercial and residential customers and from the promotion of air conditioning. Therefore we are carrying on an aggressive campaign for the sale of heavy-duty appliances such as refrigerators and washers and ironers. Also, we are promoting enthusiastically the "Better Light—Better Sight" campaign. Evidence that air conditioning has real promise is shown by the fact that in the past two years we have added 39,000 hp.

Barring unlooked-for setbacks, we believe there will be a gradual, though probably small, improvement throughout 1935. The Illinois Commerce Commission is at present holding hearings to determine whether our present rates are fair and reasonable or otherwise.

Ready for More Business

By BRITTON I. BUDD
President Public Service Company of Northern Illinois

BUSINESS conditions have shown improvement in the Chicago area, particularly over the last quarter. There seems to be a better general feeling, which is translating itself into spending. It is not expected that there will be any rapid surge to a high state of prosperity, but the general belief is that there will be continued progress to more stable conditions.

Operating utility companies have intensified their efforts to improve business through drives to increase use of their products. Without doubt this has been helpful to all business. The companies have been able to keep their properties in a high state of operating efficiency, such as enables them to render excellent service. This condition will enable them to meet public demands for service as business revival becomes more pronounced.

Future Dependent on Meeting Customer Needs

By HERBERT A. WAGNER
President
Consolidated Gas, Electric Light & Power Company of Baltimore

DURING the depression years this company has continued, in every way possible, to contribute to the general development of the territory which it serves through improvements of its service and reductions of its rates. Particular efforts have been made to bring to the solution of the problems of its customers an intelligent and sympathetic understanding of the individual customer's needs.

This will continue to be the keynote of operations in the new year.

During 1934 output showed increases reflecting the partial recovery of business in this territory. Further improvement in general conditions will result in increased use of the company's services. No estimates have yet been completed of the new business which may be obtainable in 1935.

Depression Liquidated, but Lags Confidence

By WILLIAM KELLY
President Buffalo, Niagara & Eastern Power Corporation

IN western New York the industrial power load declined almost continuously from January, 1930, till June, 1933. Then it staged a sharp recovery, continuing till August, 1933, and has run nearly level since then, but with a slight downward trend since May, 1934. In this territory nearly every industry that has survived the depression has reorganized its plant and force so that it can operate at some profit with the present volume of business.

Nearly all have increased plant efficiencies so that they can produce a given volume with considerably less power than required in 1929. This, added to the loss of load from the large number of industries that have "folded up" and permanently quit business, means that there must be a considerable increase of industrial production over that of 1929 before the industrial power load will reach 1929 figures. Industries producing building materials still show the least signs of recovery.

There are many indications in this territory that the depression has been liquidated, but there are decided evidences of lack of the confidence which is needed to start an expansion of business.

Favorable Outlook for Agriculture and Industry

By R. F. PACK
President Northern States Power Company, Minneapolis, Minn.

IN THESE central Northwest states farm conditions establish business conditions. It is pleasing to note that during the last two years the condition of our farmers has improved and the future looks rather favorable.

Improved prices did not help the farmers in the extreme drought areas, but they did help those who had crops. Authorities agree that the farm income for 1934 was larger than for either of the preceding years.

R. F. Pack

H. A. Wagner

W. Kelly

F. M. Wilkes

October reports on small-town retail sales show an increase of 21 per cent over October, 1933. There was an increase of 8 per cent for the same months in the business done by large city retail stores, showing that the touch of agricultural prosperity is just beginning to make itself felt in the big cities. Late fall reports on lumber and hardware sold in the rural districts also show increases.

This company is sharing to some degree in this betterment of general conditions, though uncontrollable increases in operating expenses, such as taxes, constitute a problem. During the year lower steps were added to our domestic rate schedules to encourage, in particular, use of more ranges, refrigerators and water heaters. Results were gratifying and residence consumption began to show a healthy increase last spring and has continued throughout the year. Power sales all through 1934 were better than the preceding year, and during the fall of 1934 commercial sales also showed an increase over 1933.

Expects 5% Increase From Sales Efforts

By FRANK M. WILKES
General Manager
Arkansas Power & Light Company, Pine Bluff, Ark.

PROSPECTS for utility business in Arkansas in 1935 look much brighter than they have for the past three or four years. The general business situation has been materially improved by the increased price of cotton and the resultant increase in amount of money in general circulation.

We are expecting our earnings, both gross and net, to improve some 5 per cent in 1935 over 1934, this to be brought about by special commercial efforts in connection with commercial illumination, domestic and commercial refrigeration, air conditioning and industrial pick-up.

There is no rate agitation in Arkansas at this time, but due to the close proximity of the T.V.A. and the wildly erroneous articles and statements made concerning this tax-subsidized power "yardstick," it hardly seems possible that we will be able to retain the very excellent public relations which we now hold.

Ready for Recovery

Electrical Manufacturers Think 1935 Big With Possibilities for Recovery and Increased Business — All Conditions Point Way to Stable Situation — Manufacturers Well Organized and Ready

By F. C. JONES
President
National Electrical Manufacturers Association

PREDICTION of coming events rests upon the interpretation of past events. A forecast of the outlook for electrical manufacturers for the coming year based upon the interpretation of events in 1934 will be but a dubious guide for determination of policy. The past year has been a confusion of cross-currents and conflicting movements, with sentiment and opinion often running contrary to actual productive activity.

Responding to the underlying forces of recovery and a potential consumer demand built up during the years of depression, industry in general, and the electrical manufacturing industry in particular, experienced during the early months of the year a most encouraging rise. Production statistics published by the Department of Commerce in the monthly Survey of Current Business showed that the output of manufactures increased steadily to a point in May 19 per cent higher than in January, or, if we discount the influence of the season, to a point 13 per cent higher than in January.

75% increase in six months

Electrical manufactures, according to product statistics compiled for the National Electrical Manufacturers Association and representing about 40 per cent of the value of the products covered by the Code of the Electrical Manufacturing Industry, rose to a figure in May 75 per cent higher than in January, or, if we take into account the seasonal influence of certain important durable consumers goods, such as refrigerators, to a point 37 per cent higher than in January. The ELECTRICAL WORLD index of electrical manufacturing activity (discontinued after June) based upon energy consumption in the production of electrical goods showed an increase during this period of 41 per cent.

Other indexes corroborated this improvement during the first part of the year. Employment for industry as a whole reached a peak in April, according to the U. S. Department of Labor, 25 per cent higher than in January, or, discounting the seasonal influence, a peak in May 10 per cent higher than in January. Employment in the electrical manufacturing industry increased until June, when the number of employees was 15 per cent higher than the January figure. In this connection it is interesting to note that the replies from a large number of manufacturers to the questionnaires sent out early in the year indicated that as a result of the code the level of employment was approximately 20 per cent higher than it would have been otherwise.

A closer indication of industrial activity, the number of man-hours worked, reached a peak in April for industry in general 21 per cent above the January figure, while for the electrical manufacturing industry the maximum reached, in June, was 26 per cent above the January figure. The average weekly earnings for industry as a whole attained the high point in April at 10 per cent above January, while earnings in the electrical manufacturing industry continued to rise until June, when they were 18 per cent higher than in January.

The U. S. Department of Commerce quarterly statistics on new orders booked by 78 electrical manufacturing companies gave $92,000,000 for the first quarter of 1934 and $128,000,000 for the second quarter, an increase of 38 per cent. Total sales for the first half of 1934 reported to the Code Authority by the manufacturers of electrical products coming under the code amounted to $384,000,000, or 48 per cent higher than the sales for this period in 1933. And finally, the published quarterly income statements of seven of the largest companies in the industry, representing together slightly less than one-half of the total sales and employees of the industry, showed profits for the second quarter more than quadruple those of the first quarter, an increase from $1,892,000 in the first quarter to $8,257,000 in the second.

While this generous upward swing of industry was in progress, however, business confidence was kept in a condition of perpetual agitation over the vacillations of government policy. Although part of the expansion in production and trade may be directly attributed to the lavish expenditure of federal funds in loans, subsidies and public works, these same government expenditures were a factor in disturbing confidence by arousing question as to the possibilty of maintenance of national credit. A continued increase in the national deficit cannot but result in some form of dangerous inflation, either credit inflation or currency inflation.

Business view prevails in Washington

Early in the year officials in Washington had begun to entertain misgivings as to the results of some of the major emergency experiments which did not seem to be working out as ex-

pected. Private capital, they began to recognize, must somehow be induced to take the initiative, and this meant that private capital must be allowed to regain confidence. Accordingly, various announcements were made from time to time to encourage belief in the government's appreciation of the business point of view. But no sooner was business beginning to gain heart than the Administration would take some action looking toward extension of government control or operation of industry, utilities or railroads, punishing the stock market, regimenting the farmer to reduce cotton acreage or slaughter hogs, or flirting with monetary or credit inflation, as by remonetizing silver—all of which again aroused uncertainty and fear and made impossible any long-term commitments.

Labor troubles a big deterrent

The situation was further aggravated by labor troubles, owing to the obscure wording of Article 7a of the NIRA, and it looked probable that until some definite interpretation of this article could be obtained from official sources, strikes would continue to grow in frequency and gravity.

After May these doubts and uncertainties began to assume a major rôle. Industrial activity itself began to waver, and finally turned downward faster than the normal seasonal turn would justify. From an index figure of 119 in May (January as 100) general industrial production, according to the Survey of Current Business, fell to 96 in September. This drop was more severe than would be justified by the seasonal influence. In fact, the adjusted index showed a decline from the peak of 113 to 91 in September. The electrical manufacturing industry fared better, although following the same trend. According to NEMA product statistics, the low point reached in September was slightly higher than the January figure, *i.e.*, 102. Employment indexes show a similar decline: For industry as a whole, a drop of employment to 100, man-hours to 103 and average weekly earnings per employee to 103. For the electrical manufacturing industry there was a decline of employment to 114, man-hours to 115 and average weekly earnings to 111. New orders booked by the 78 companies in the U.S. Department of Commerce quarterly compilation fell from $128,000,000 in the second quarter to $100,000,000 in the third quarter, and aggregate profits of the seven companies above referred to dropped from $8,257,000 to $4,105,000.

Code operations successful

In spite of the difficulties which the electrical manufacturing industry has been facing in company with others, it has heartily endeavored to cooperate with the government for constructive progress. The National Electrical Manufacturers Association, selected to represent the industry as its Code Authority, has conscientiously administered the code in the interest of all concerned. The membership of the association has increased during the fiscal year to August 31 by 62 per cent.

Owing to the diversity of products and of the problems of distribution, marketing, employment, etc., within the electrical manufacturing industry, the association is organized in such a way that manufacturers interested in particular products are combined into specific sections or groups. This permits discussion of special problems concerning these products and, further, makes possible the collection of statistical data appropriate to their type of product to be used as a basis for intelligent direction of policy. Evidence of the growing interest in industrial self-guidance possible through such groups is the increase from 58 groups to 175.

Data needed on demand and supply

One of the major evils of our modern industrial organization has been the lack of sufficiently detailed knowledge of the current conditions of demand and supply. In the absence of such information misjudgment of current demand and supply on the part of some manufacturers has been practically inevitable. Overexpansion of capacity and overproduction of goods has resulted, exaggerating the distress of the depression (which otherwise might have been confined to a more purely financial crisis similar to that of 1907) and leading to an intensification of uneconomic and destructive practices. It has been the purpose of the NRA to correct these practices, but even though the Code of the Electrical Manufacturing Industry provides for open-price procedure, this has not been entirely successful, owing in considerable part, probably, to a lack of common knowledge of the basic facts of demand and supply.

Statistics stabilize business

Statistical information on current conditions of demand and supply to be of any practical value must be specific, relating, that is, to given commodities rather than to general groups including a wide variety of commodities. The members of the product sections in NEMA are encouraged to designate the particular statistics which will be of greatest value to them. As an indication of the extent to which electrical manufacturers have been availing themselves of the opportunity to obtain such data for the guidance of production, we may point to the expansion of this work of the statistical department. The aggregate of the member companies contributing statistics for each of the several groups has increased by nearly 75 per cent.

The latest available statistics at the moment of writing indicate for October and November a slight upward turn, doubtless of seasonal nature, both for industry in general and for the electrical manufacturing industry. The potential market for electrical products is greater than it ever has been, and the home building and renovation contemplated by the Federal Housing Administration may contribute its share to the demand for electrical supplies and commodities. And there are other grounds for confidence. Without peering too closely beneath the surface, the intention to co-operate evidenced by the banks and the government at the Washington convention of the American Bankers Association promises at least a banking system conformable to administrative policy. The Congress of American Industry, attended by the largest gathering of business men for a purpose of this kind since the depression, also gave a generally favorable impression. Finally, the amazing success of the government's recent financing operations, doubtless reflecting these factors, stands in sharp contrast to the previous important financing in September.

The coming year of 1935 *may* witness the recovery of industry to which we have so long been looking forward. The machinery for recovery of the electrical manufacturing industry is ready. The outlook for the electrical manufacturing industry for 1935, in short, remains big with possibilities for recovery and increased business.

Encouraging Business Outlook

Volume Increases Continue—New and Better Products Available — Executives Discount Social Uncertainty and Reflect Optimism

Substantial Increase Is Expected

By OTTO H. FALK
Chairman
Allis-Chalmers Manufacturing Company

THE year 1934 closes with sales of electrical machinery substantially higher than for either of the two preceding years. The improvement since the low of 1932 has been encouragingly upward and there are definite signs that 1935 will show accelerated growth. Machinery requirements for many public works projects, previously authorized, should come to fruition during 1935, and it is this type of business that will doubtless account for much of the expected volume.

We also look for the release of a sizable volume of business that has been pent up awaiting acceptable financing. This will be largely for private enterprise, consisting of replacement needs, and for new developments which will go ahead with reasonable assurance that a market is ready to receive the products of invention. Taking these factors and others into consideration, we look for 1935 to show a fairly substantial increase over 1934 in the heavy electrical field.

O. H. Falk

B. W. Kerr

Edmund Lang

Profitable Year Encourages Outlook

By B. W. KERR
President
Railway & Industrial Engineering Company, Greensburg, Pa.

I AM definitely much encouraged as to the prospects for 1935, because 1934 has shown for us great improvement over several previous years. In fact, I am looking at 1935 with a highly optimistic view because of a reasonable profit for the year 1934.

I am convinced that there will be great activity in the construction of distribution systems during the coming year. The question is whether this will be done by the utilities or by the federal government. It is up to the utilities to make the choice, and I believe their choice will be to go ahead in their own name. There are a large number of power houses in the United States which are almost obsolete. Replacement of these stations would show great economy. This also applies to switching stations and substations. From our particular viewpoint, we know that outdoor equipment exposed to varying atmospheric conditions will not last forever. Much of it must and will be replaced in 1935.

Expects Expansion of Replacement Market

By EDMUND LANG
President
Crocker-Wheeler Electric Manufacturing Company

ANY attempt at this time to evaluate the future necessitates the examination of many more factors than in normal times. However, I feel the trough of abnormally low business is now sufficiently far in the background so that machinery replacements, needed because of obsolescence and wear, will be bought in 1935 to a greater volume than in the past five years.

If the government spending keeps up, with more focus on the durable-goods industry, 1935 should show a minimum of 15 per cent better business than 1934, which I believe would be sufficient to bring many manufacturers of durable goods from the loss to the profit column.

Meter-Sales Prospects Very Encouraging

By F. HOLMES
President
Duncan Electric Company, Lafayette, Ind.

THE year 1932 was the low point for meters, and desperately low it was; 1933 was a little better; 1934 is more than encouraging, and we expect 1935 to be even better.

Like many other forward-looking manufacturers, we have taken advantage of the depression years to redesign our product radically and to improve processes, layouts and tooling. The new designs make full use

of new materials and modern technology. We are confident that this expenditure of time, money and effort has been well spent.

The newly standardized outdoor and indoor meter mountings and improvements made by all manufacturers mean that better meter value is being offered today than ever before. Fortunately, too, the courage and initiative of public utilities in selling more energy and adding customers mean that these better values will be used.

Improvement in 1935

By GERARD SWOPE
President
General Electric Company

THE volume of electrical manufacturing business during 1934 has been more than 30 per cent greater than in 1933. Consumption of electricity throughout the United States has been approximately 7 per cent greater than in 1933 and is almost up to the maximum consumption in the years 1929 and 1930. This increase has been due largely to the increased use of electrical appliances in the home.

The electrical manufacturing industry, and industry in general, has felt most seriously the failure of the revival of orders for capital goods, but with the increased use of electricity and consumers' goods in general, capital goods must also increase.

For the year 1935 we look forward to a continued improvement in business.

Marked Progress Is Anticipated

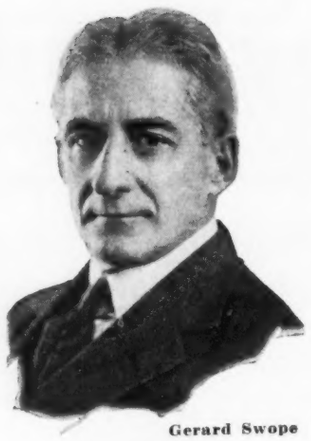
By R. J. RUSSELL
Vice-President
Century Electric Company, St. Louis, Mo.

WE HAVE been misled so many times in the five years just past as to what the future held for the motor manufacturers that we really hesitate to express our opinion for publication, but here it is:

1. There is an increasing demand for replacing durable goods that have been worn out, that have become so obsolete that competition forces their replaceal, and for new and expanded manufacturing facilities on the part of many who are increasing the number of items included in their manufactured product.

2. Also, those who serve the public, in the marts, entertainment or business houses, are realizing the necessity of providing greater comfort and better sanitary conditions—all of which is accomplished with durable goods.

3. For these reasons, if no others, we believe the determination which has been characteristic of the durable goods industry to regain its position in the market will result in marked progress during the year 1935.



Gerard Swope

R. H. Morse

R. J. Russell

F. A. Merrick

An Opportunity for Diesels

By ROBERT H. MORSE
President Fairbanks, Morse & Company

AS WE turn another year on the calendar and start on 1935 several essential influences affecting business prospects come into view.

For the Diesel engine industry the outlook is extremely favorable. Rapid strides have been made during 1934 in the application of Diesel engines to a widening market—a market that now embraces fields previously not touched by Diesel power. The trend toward the Diesel, which has been so definite, will continue in 1935 and will show a continuance of the employment of Diesel engines in all types of mobile equipment, transportation facilities, heavy-duty construction equipment, as well as in the more standardized stationary industrial plants and marine equipment. It is my belief that every one of these classes of power application will see a greater number of Diesel engines installed during the coming twelve months.

In the industrial field the pick-up in production probably will not require much more power as the business improvement has not been uniform, with the result that present equipment is of sufficient capacity to take care of much greater loads. The trend toward decentralization of power generation may assist in improving this field.

With a return of confidence, business should show a willingness to invest capital in durable goods for improvements of a permanent nature, especially where such investments will result in lower production costs. The great amount of governmental regulation imposed on business resulting in increased labor costs, etc., makes it necessary for executives to exercise every possible economy in the one controllable factor in manufacturing and operating costs, namely, power. The Diesel engine is particularly suited to just such requirements.

One fact generally recognized by the rapidly growing group of engineers now giving consideration to Diesel en-

gines is that the factor of obsolescence in a Diesel plant is small. In spite of the enormous development and tremendous advance in the engine building industry in the last ten years Diesel plants installed ten years ago are not old and are not obsolete. They still are efficient and economical power plants. This one factor alone is responsible for the preference and confidence engineers generally have in Diesel engines wherever they may be applied.

It is my sincere belief that the trend indicated a year ago pointing toward a substantial increase in 1934 is again present, and I look for continued improvement in 1935. It will be a year of great opportunity for Diesel engine builders.

Groundwork Laid for Progress

By F. A. MERRICK
President
Westinghouse Electric & Manufacturing Company

ALTHOUGH there was a late summer and fall decline in indices of industrial activity, the year 1934 as a whole will show improved returns compared with 1933. With the many complexities in both governmental and business problems, it is too much to expect that progress toward recovery will be in one unbroken line of steady improvement. The most favorable augury for progress is in the recently displayed willingness of government and business to consolidate their common desires and activities for the promotion of recovery on a realistic basis.

A. W. Robertson

The electrical manufacturing industry has shared in the gains of the past year, but is still operating at a rate little better than half of what could be called normal. During 1935 further improvement is expected. Merchandising lines should feel the stimulus given to the major appliances by the continuing successful efforts of the power companies and the increasing interest in distribution of electrical appliances shown by department stores and other electrical merchandising outlets. Manufacturers have continually improved and extended their lines of appliances for household uses.

Jointly, these efforts have greatly contributed to offsetting the reduction of industrial consumption during the depression so that, now, only a reasonable improvement in the industrial load, particularly the heavy industrial, will compel utilities to enter the market for generation-station extensions which have been so notably absent in recent years. In the meantime, recent improvements in distribution apparatus have been so favorably received that increased sales should be realized in 1935 for this important line of apparatus. Diesel-electric propulsion equipments earned prestige in 1934 as a factor in certain phases of transportation modernization and operating-cost reduction. There should be an increase in Diesel-electric application during the coming year. Naval and other government-building programs excite well-founded expectations that some increase in demand for electrical apparatus will accrue therefrom.

Despite all the improvements in prospect, it is yet unreasonable to expect that 1935 will fully bridge the gap between depression and recovery. But there is substantial reason for the belief that the groundwork is being laid for a progressive return to prosperous times.

Best in Three Years

By A. W. ROBERTSON
Chairman of the Board
Westinghouse Electric & Manufacturing Company

BUSINESS and government are beginning to pull together. The load is beginning to move. As these two forces learn to work in harmony under the new conditions, marked improvement in economic conditions may be expected.

The fall business of electric manufacturers is the best in three years. Prospects for next year are good.

The Joint Conference for Business Recovery Makes a Report on

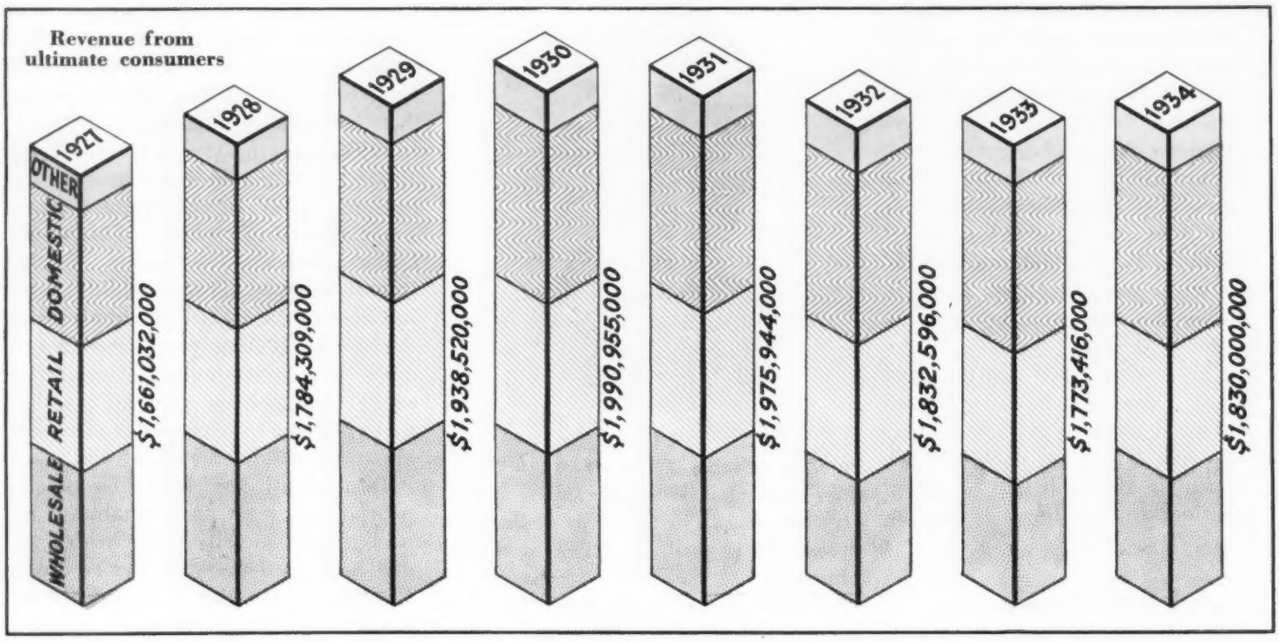
Government Competition

THE great majority of the people owns American business. Each of the sixty-odd million insurance policyholders, each man or woman who has savings in banks or building loan associations, each holder of a share of stock or a bond, has such savings invested in some corporate business activity. In addition, there are nearly three million partnerships and industrial undertakings. When government—federal, state or local—enters a business it competes unfairly with the great mass of its own citizens. The small business and the industry of small means are the first to suffer.

The federal government is now competing in more than two hundred different kinds of business. Programs for work-relief do not justify the government's entering into competition with its private citizens in the production of goods and their distribution for relief purposes. Government competition dries up the source of its own support.

Government competition with private business leads toward socialism. This destructive competition, carrying with it the threat of extension into other fields, has profoundly shaken confidence.

Our government was neither conceived nor fashioned to engage in competition with its citizens. Such competition disregards many recognized elements of costs. Then it employs the taxes of the citizen to menace his enterprise, it threatens the security of his job, the safety of his savings, and converts his compulsory support of his government through taxation into a weapon for his injury.



Utilities in a Recovery Year

More Output, More Revenue—More Expenses, More Taxes—More Wages, but Less Net Earnings—Home Electricity Cheaper Than Ever

TO SUPPLY the people of the United States with electrical energy requires equipment in which is invested about $12,900,000,000, somewhat less than half of it in the form of long-term debt. This equipment includes nearly 48,000,000 hp. in machinery driven by steam, oil, gas and water, 34,000,000 kw. of generators, 200,000 miles of high-tension circuits and the associated vast system of substations, transformers, distribution network, services and meters for 25,000,000 customers.

On the human side is a staff of nearly 250,000 employees who receive annual wages of $320,000,000, a sum three times as large as the cost of fuel. In the case of private corporations, which supply 94 per cent of the energy used, the largest additional item of expense is taxes. These have now risen to about five-sixths of the amount paid for salaries and wages. So much has

Revenue of the Electric Light and Power Industry by Sources—1926-1934

Year	(Thousands of Dollars) Revenue from Ultimate Consumers								Other Electric Service[1]	Total Revenue for Electric Service[1]
	Total	Domestic	Com'l Light and Power		Municipal Street Lighting	Electric Railways	Electrified Railroads	Municipal and Misc.		
			Retail	Wholesale						
1926	1,520,159	478,182	427,407	488,915	68,023	47,618	4,373	5,641	101,391	1,621,550
1927	1,661,032	523,689	482,136	519,074	77,248	47,965	5,172	5,748	141,623	1,802,655
1928	1,784,309	571,620	519,957	549,989	83,024	46,489	5,560	7,670	157,646	1,941,955
1929	1,938,520	618,799	555,640	613,172	88,323	46,277	5,986	10,323	167,380	2,105,900
1930	1,990,955	664,441	575,598	590,992	95,458	46,068	6,015	12,383	160,195	2,151,150
1931	1,975,944	678,611	564,524	570,127	99,299	41,912	6,725	14,746	149,166	2,125,110
1932[2]	1,832,596	669,200	528,861	476,450	100,919	38,311	5,821	13,034	147,394	1,979,990
1933	1,773,416	656,570	499,684	465,191	94,270	36,359	6,550	14,792	132,694	1,906,110
1934[3]	1,833,250	675,000	510,000	496,000	93,000	38,000	6,750	14,500	135,000	1,966,000

[1]Including sales for resale, involving some duplication. [2]For consistency with other years E. E. I. figures are given also for census year 1932. Census total is $1,975,303,955; to ultimate consumers $1,821,105,524. [3]Estimated on the basis of ten months' operations.

Distribution of Central Station Energy—1926-1934

(Millions of Kilowatt-Hours)

Year	Generated In Central Stations*	Distributed to Ultimate Consumers								Losses	Company Use		Total Including Purchased Energy
		Total	Domestic	Com'l Light and Power		Municipal Street Lighting	Electric Railways	Electrified Railroads	Municipal and Miscel.		Railway	Other	
				Retail	Wholesale								
1926	69,158	56,089	6,827	9,485	32,615	1,589	4,951	426	196	11,834	1,530	1,023	70,476
1927	74,686	61,251	7,676	10,766	35,263	1,741	5,039	504	262	12,659	1,348	1,111	76,369
1928	82,927	66,988	8,619	11,692	38,903	1,911	4,991	560	312	13,842	1,330	1,235	83,395
1929	91,421	75,294	9,773	13,106	44,326	2,038	5,049	590	412	14,983	1,279	1,201	92,757
1930	89,952	74,906	11,018	13,944	41,621	2,227	4,997	591	508	14,561	1,184	1,306	91,957
1931	86,312	71,902	11,738	13,544	38,451	2,320	4,549	626	664	14,162	970	1,366	88,400
1932	77,868	63,764	11,987	12,932	31,186	2,364	4,175	540	580	13,678	843	1,220	79,505
1933	79,983	65,754	11,960	12,475	33,723	2,213	4,004	661	718	14,256	699	1,204	81,913
1934[1]	84,895	70,730	12,750	13,100	36,950	2,210	4,350	700	670	14,470	640	1,200	87,140

*By courtesy of U. S. Geological Survey with deductions for plants not considered as central stations for light and power. [1]Estimates based on ten months' operations.

been said about the desirability of using water power that it may be pertinent to point out that 36 per cent of the total energy generated in electric light and power plants during 1934 came from that source, and that in favorable years it has been as much as 40 per cent. These figures represent the present economic balance between hydraulic and thermal energy, taking into account the distribution of population with reference to fuel deposits and sources of water power and the cost of capital for the plants and transmission systems required to bring the energy to the places where it is to be used.

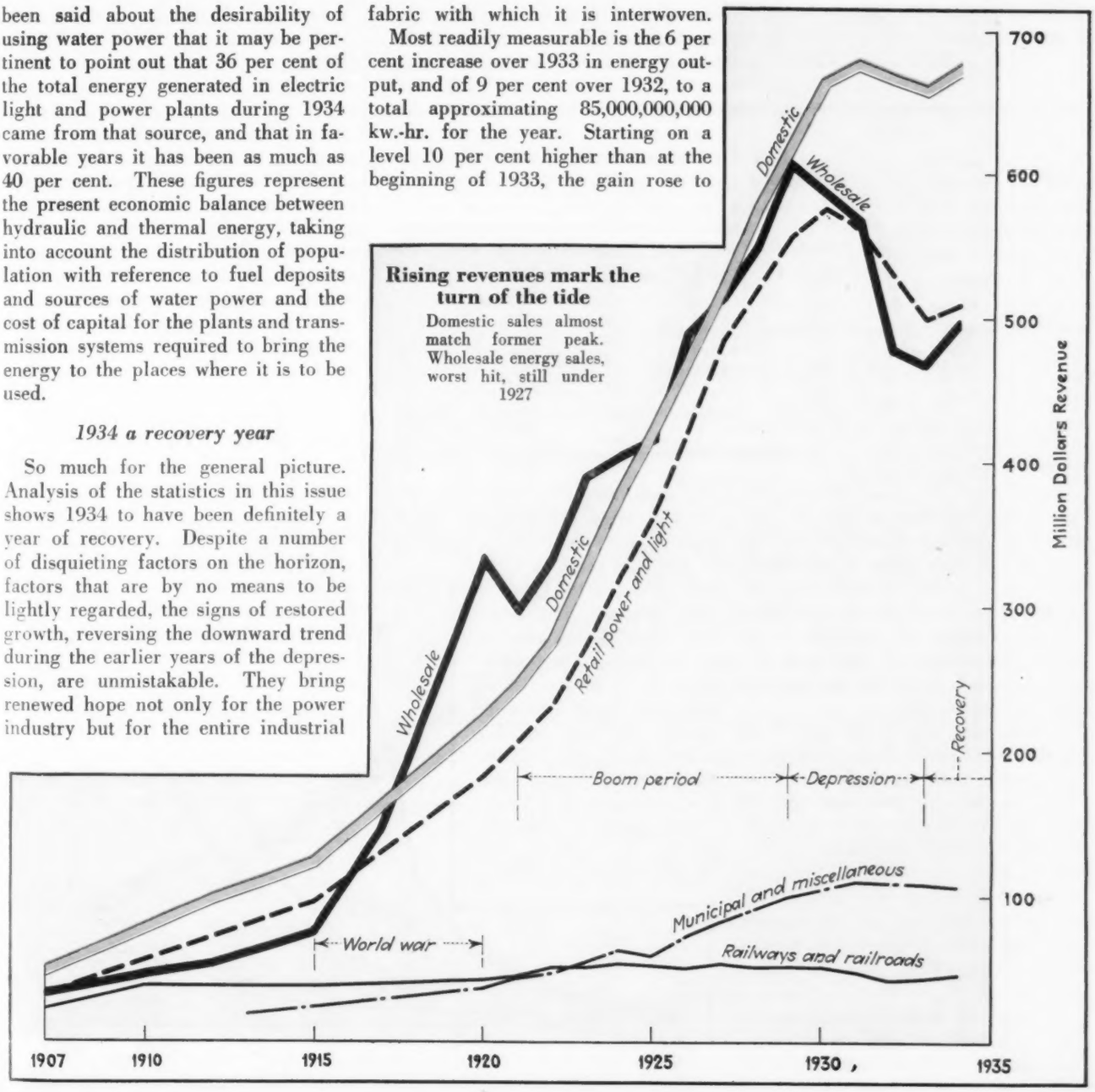
1934 a recovery year

So much for the general picture. Analysis of the statistics in this issue shows 1934 to have been definitely a year of recovery. Despite a number of disquieting factors on the horizon, factors that are by no means to be lightly regarded, the signs of restored growth, reversing the downward trend during the earlier years of the depression, are unmistakable. They bring renewed hope not only for the power industry but for the entire industrial fabric with which it is interwoven.

Most readily measurable is the 6 per cent increase over 1933 in energy output, and of 9 per cent over 1932, to a total approximating 85,000,000,000 kw.-hr. for the year. Starting on a level 10 per cent higher than at the beginning of 1933, the gain rose to

Rising revenues mark the turn of the tide

Domestic sales almost match former peak. Wholesale energy sales, worst hit, still under 1927



Total and Fuel-Generated Energy, Coal Consumption and Economy

Including electric light and power, electric railway, Bureau of Reclamation and certain other plants generating energy for public consumption. (U. S. Geological Survey). For light and power plants only see table below and on page 37.

Year	Kw.-Hr. Generated In All Public Utility Plants (Millions)	Kw.-Hr. Generated from Fuel (Millions)	Coal Consumed (Millions of (Tons)	Coal Equivalent of All Fuel† (Millions of Tons)	Pounds of Coal per Kw.-Hr.‡	Capacity end of Year Kw.)
1919	38,921	24,176	35.10	38.88	3.2	13,093,972
1920	43,555	27,248	37.13	41.43	3.0	14,399,052
1921	40,976	25,863	31.59	35.25	2.7	15,482,526
1922	47,659	30,240	34.18	38.01	2.5	15,970,787
1923	55,674	36,092	38.96	43.53	2.4	17,369,127
1924	59,014	38,808	37.56	43.14	2.2	19,519,000
1925	65,870	42,264	40.23	44.79	2.1	23,618,762
1926	73,791	47,274	41.32	45.86	1.95	25,398,385
1927	80,205	50,330	41.88	45.91	1.84	27,690,891
1928	87,850	53,154	41.35	46.39	1.76	29,629,702
1929	97,352	62,723	44.94	52.57	1.69	31,952,396
1930	95,936	62,915	42.90	50.65	1.62	34,263,944
1931	91,729	61,126	38.73	47.13	1.55	35,590,072
1932	83,153	49,055	30.29	36.60	1.50	36,060,593
1933	85,402	50,674	30.58	37.16	1.47	36,038,465
1934*	90,140	57,520	33.76	41.71	1.45	°35,832,878

*Estimated on basis of 10 months' operations. †Includes oil and natural gas, but not wood. ‡Excluding output from wood-burning plants. °As of November 1.

Fuel Consumption Annually

(Central Stations Only and All Public Utility Plants)

Year	Central Stations Coal[1]	Central Stations Oil[2]	Central Stations Gas[3]	All Public Utilities Coal[1]	All Public Utilities Oil[2]	All Public Utilities Gas[3]
1927	37,501	7,146	66	41,888	6,782	63
1928	37,593	6,852	77	41,350	7,158	77
1929	41,406	9,740	112	44,937	10,124	113
1930	39,702	8,950	119	42,898	9,260	120
1931	35,690	7,899	138	38,734	8,123	139
1932	27,589	7,269	107	30,290	7,967	108
1933	28,039	9,446	101	30,575	9,940	103
1934*	31,142	9,948	131	33,757	10,261	135

*Estimated on 10 months' operations.
[1]Thousands of tons.
[2]Thousands of barrels.
[3]Billions of cubic feet.

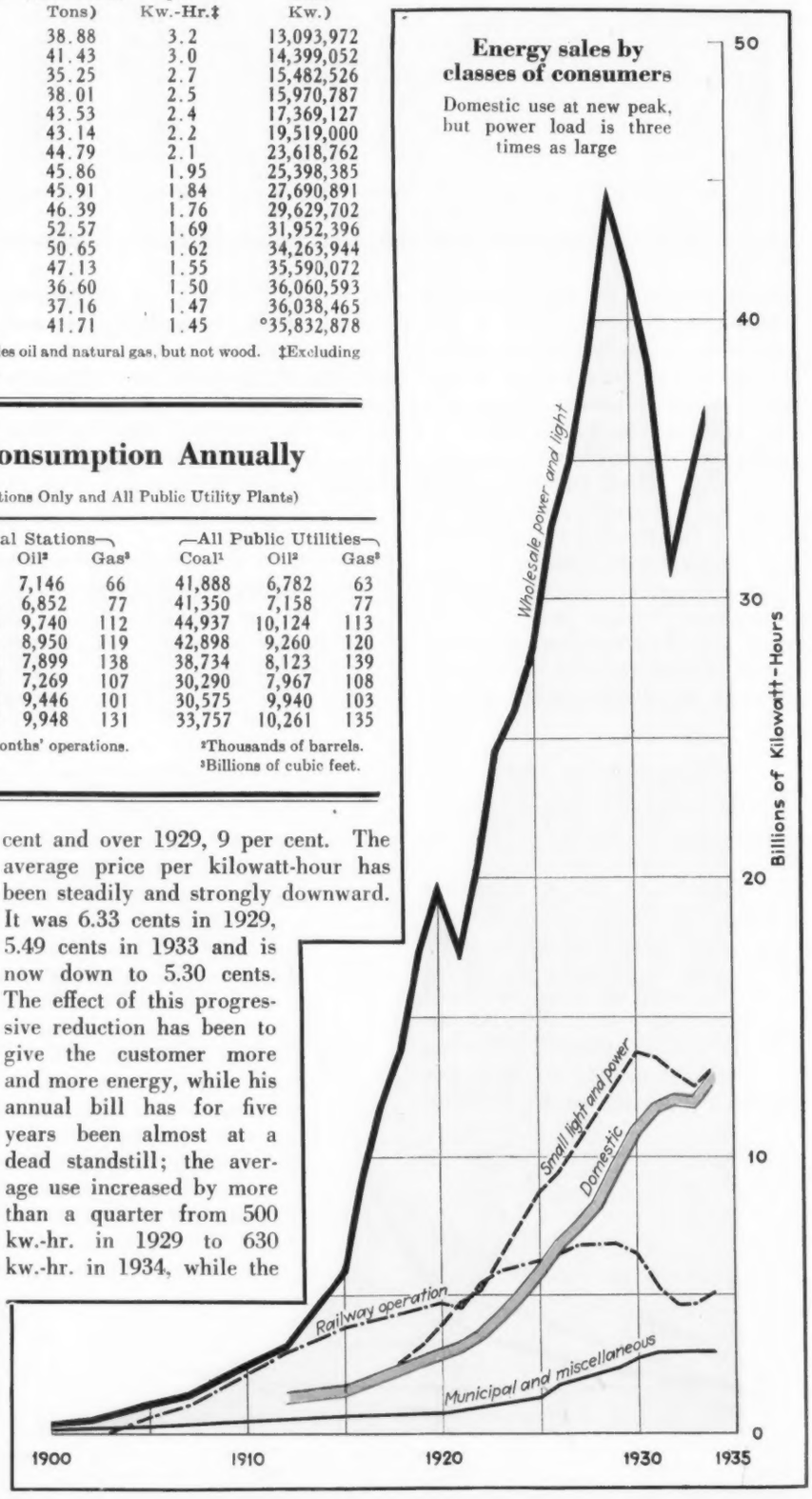
nearly 20 per cent in March. In contradiction to the usual decrease during spring production steadily rose. In midsummer it remained above the high mark reached in the spectacular uprush of June, 1933. In September the customary autumn rise set in, but the climb was steeper than usual and the year drew to a close with production outrunning that of any other except 1929, which it missed by a narrow margin. Energy sales at wholesale, representing mainly industrial use, advanced 9 per cent over the preceding year, but cannot be expected to get back to former records until manufacturing resumes its stride, especially in the heavy industries.

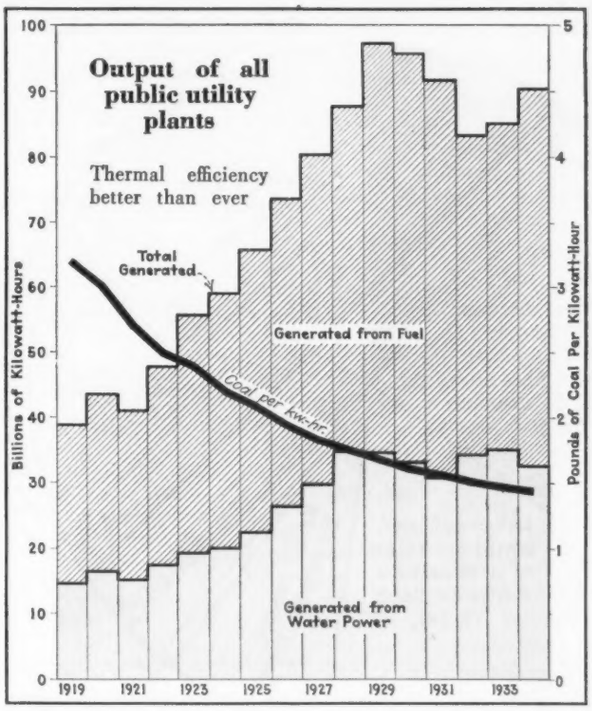
Rivaling all others is the showing in the domestic field, where consumption was greater than ever before, 6.6 per cent more than in 1933 and fully 30 per cent more than in 1929. With the increasing use of appliances, notably refrigerators, the needs of domestic users in the summer-time have greatly expanded; the sag in the warmer months has been flattened and the winter peak is much less pronounced than formerly.

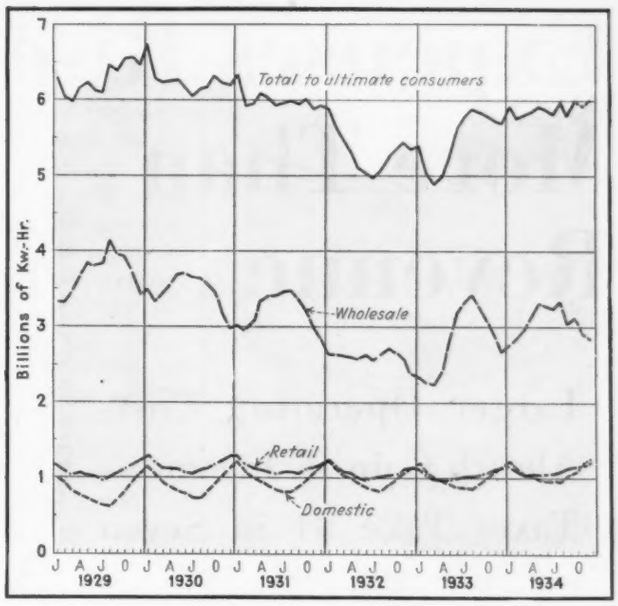
Revenue for domestic service has by no means kept up with energy sales. The increase over 1933 was only 3 per cent and over 1929, 9 per cent. The average price per kilowatt-hour has been steadily and strongly downward. It was 6.33 cents in 1929, 5.49 cents in 1933 and is now down to 5.30 cents. The effect of this progressive reduction has been to give the customer more and more energy, while his annual bill has for five years been almost at a dead standstill; the average use increased by more than a quarter from 500 kw.-hr. in 1929 to 630 kw.-hr. in 1934, while the yearly cost has been varying only slightly from last year's $33.20, and since 1931 has been gradually diminishing.

Smaller growth in revenue

Although the home, office, store and factory have considerably expanded







Monthly energy sales

1934 a year of rising consumption. Domestic use in summer is growing

their purchases of energy the revenue from these combined sources was only 3.4 per cent more than in 1933, the estimated amount (pending receipt of final returns) being $1,833,250,000, or very close to that of 1932. This sum excludes intercompany sales. The increase over the preceding year was about $60,000,000, but this was more than absorbed by rising costs. Operating expenses alone increased by that entire amount to $858,000,000 and in addition taxes rose by an amount that cannot yet be closely determined, but was at least $25,000,000.

Probably for the first time in the history of the industry the depression finally brought about a decrease in the total generator rating, retirement of obsolete equipment exceeding additions. The net decrease was small in 1933, but rose to 200,000 kw. in 1934.

The turn has, however, set in; installations to the amount of nearly 500,000 kw. are nearing completion and 1935 will presumably see a resumption of the usual increase, though not on the former scale.

Changes in plant being almost negligible it might seem that there could be little change in their efficiency, considered on a nation-wide scale. But somehow the improbable has happened and another few tenths of a pound have been clipped from the quantity of coal used to generate a kilowatt-hour.

Employment has been well maintained, most of it on full time. It averaged only 16 per cent under 1929, and pay-rolls only 22 per cent, according to the Bureau of Labor Statistics. Per employee this amounts to a decrease of 7 per cent.

Revenue from Ultimate Consumers, by Regions

(In Millions of Dollars)

	1927*	1931	1932*	1933	1934[1]
United States	**1,667**	**1,976**	**1,821**	**1,773**	**1,833**
New England....	138	162	155	154	157
Middle Atlantic.	475	579	541	526	541
East No. Central	403	458	413	400	415
West No. Central	141	168	155	150	158
South Atlantic...	154	174	161	160	162
East So. Central.	60	72	65	63	64
West So. Central	90	110	101	97	102
Mountain.....	51	59	52	51	53
Pacific.....	155	194	177	172	181

*U. S. census of Electric Light and Power.
[1]Estimated on ten months' operations.

Energy Generated in Light and Power Plants*

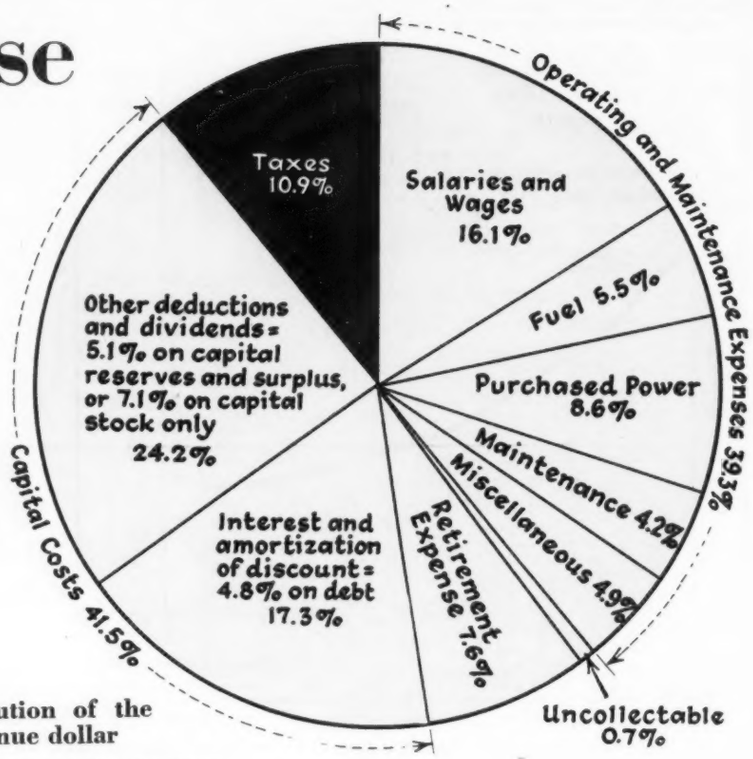
(For *all* public utility plants see table on page 36)

	1932				1933				1934[1]				Increase
	Billions of Kw.-Hr.			Per Cent	Billions of Kw.-Hr.			Per Cent	Billions of Kw.-Hr.			Per Cent	'33–'34
Region	Total	Hydro	Fuel	Hydro	Total	Hydro	Fuel	Hydro	Total	Hydro	Fuel	Hydro	Per Cent
United States.....	77.87	31.88	45.99	41	79.98	32.45	47.53	41	84.89	30.69	54.20	36	6.0
New England.....	5.25	2.79	2.46	53	5.61	2.58	3.03	46	5.83	2.56	3.27	44	4.0
Middle Atlantic.....	19.90	5.94	13.96	30	20.21	6.23	13.98	31	21.56	6.14	15.42	28	6.5
East No. Central...	17.85	2.03	15.82	11	18.52	1.92	16.66	10	20.22	1.64	18.58	8	9.0
West No. Central...	5.33	1.53	3.80	29	5.28	1.47	3.81	28	5.39	.98	4.41	18	2.0
South Atlantic.....	9.26	5.55	3.71	60	9.84	5.94	3.90	60	9.97	5.12	4.85	51	1.2
East So. Central....	3.26	2.69	.57	83	3.23	2.68	.55	83	3.35	2.63	.72	78	3.5
West So. Central....	4.15	.16	3.99	4	4.05	.17	3.88	4	4.38	.12	4.26	3	8.0
Mountain.....	2.34	1.78	.56	76	2.57	2.05	.52	80	2.70	2.11	.59	78	5.0
Pacific.....	10.53	9.41	1.12	89	10.61	9.41	1.20	89	11.49	9.39	2.10	82	8.1

*By courtesy of United States Geological Survey, with deductions for plants not considered light and power enterprises. [1]Estimated on ten months' operations.

Expenses Rise More Than Revenue

Larger Operating Costs Absorb Gain in Income—Taxes Take $1 in Seven


Operating and Maintenance Expenses 39.3%
Capital Costs 41.5%
Taxes 10.9%
Salaries and Wages 16.1%
Fuel 5.5%
Purchased Power 8.6%
Maintenance 4.2%
Miscellaneous 4.9%
Retirement Expense 7.6%
Uncollectable 0.7%
Interest and amortization of discount = 4.8% on debt 17.3%
Other deductions and dividends = 5.1% on capital reserves and surplus, or 7.1% on capital stock only 24.2%

Distribution of the revenue dollar

Commercial Companies

Based on U. S. Census for 1932

Total $1,873,364,454: From ultimate consumers $1,703,303,728; sales for resale $161,120,995; other $19,254,945. Revenue for energy for resale approximately balances corresponding expense item.

UNTIL 1932 the ratio of operating and maintenance expenses to total revenue gradually decreased. During a fifteen-year period it dropped from 61.3 per cent in 1917 to 41.5 per cent in 1932, according to the Electric Light and Power Census. In 1933 it was about the same as in 1932, but 1934 brought a distinct rise to 43.7 per cent. Compared with a total revenue for electric service of $1,975,304,000 in 1932, $1,906,110,000 in 1933 and an estimated $1,965,000,000 in 1934, the expenses were $817,956,000, $795,811,000 and $858,000,000, respectively. These figures include revenue from ultimate consumers and, on both sides of the account, sales and purchases of energy for resale, and they apply to the entire industry, municipal as well as private companies. Thus the entire increase of $60,000,000 in revenue in 1934 compared with 1933 was absorbed by larger expenses, leaving virtually the same balance in both years.

Various influences contributed to the rise in expenses. Increased energy production coupled with the widespread drought which began last spring increased the coal consumption by more than 3,000,000 tons. Prices were higher. Resumption of service by former customers and the adding of new ones called for several hundred thousand connections. Such things are to be expected in the course of business.

But there has been another and

Revenue and Taxes

Compiled by Edison Electric Institute

	Operating Revenue* (Thousands of Dollars)			Taxes (Thousands of Dollars)			Ratio: Taxes/Revenue (Per Cent)		
Year	Commercial Companies	Municipal Plants	Total Industry	Com'l Cos.	Munic. Plants	Total Industry	Com'l Cos.	Munic. Plants	Total Industry
1902	77,132	6,961	83,973	2,655	10	2,665	3.44	0.15	3.17
1907	156,447	14,006	170,123	6,346	5	6,351	4.06	0.04	3.73
1912	268,360	18,627	285,926	13,117	30	13,147	4.89	0.16	4.60
1917	464,881	34,978	496,891	29,897	166	30,063	6.43	0.47	6.05
1922	883,334	79,435	955,217	73,128	645	73,773	8.28	0.81	7.73
1927	1,588,908	(a)	.....	150,253	(a)	.....	9.46	....	.....
1932	1,737,973	120,843	1,841,706	203,858	1,292	205,151	11.73	1.07	11.14
1933†	1,690,000	.....	.....	215,000	....	.....	12.72	....	.....
1934‡	1,717,000	121,000	1,838,000	239,000	1,300	240,300	13.9	....	13.0

Data from U. S. Census, except for 1933 and 1934.

* Duplications due to sales for "resale" have been eliminated. Revenue of commercial companies includes revenue from ultimate consumers, from sales to municipal plants for "resale," and miscellaneous operating revenue. Revenue of municipal plants includes revenue from ultimate consumers, from sales to commercial companies for "resale," and miscellaneous operating revenue. The total industry figures eliminate all intercompany sales for "resale," being the sum of revenue from ultimate consumers plus miscellaneous operating revenue.

† Preliminary percentage for 1933 computed by E. E. I. on returns from over 90 per cent of private (commercial) electric light and power enterprises.

‡ Revenue estimated by ELECTRICAL WORLD on ten months' operations; taxes on known additional imposts effectvie in 1934.

(a) Not called for by census for all municipal plants for 1927.

Comparison of Revenue and Operating Expenses

(Thousands of Dollars)

Year	Total Revenue for Electric Service	Operating and Maintenance Expenses (ex Taxes)	Operating Ratio
1917*.....	502,060	308,214	61.3
1922*.....	1,020,329	553,068	55.3
1926.....	1,661,550	787,000	47.3
1927*.....	1,802,655	828,168	46.0
1928.....	1,941,955	866,350	44.7
1929.....	2,105,900	934,890	44.3
1930.....	2,151,110	946,180	44.0
1931.....	2,125,110	913,910	43.0
1932*.....	1,975,304	817,956	41.5
1933.....	1,906,110	795,811	41.7
1934†.....	1,965,000	858,000	43.7

*Census.

†Estimated on ten months operations.

Consolidated Balance Sheet For Private Companies

(Millions of Dollars)

	1932	1933	1934
(1) Revenue	1,873	1,807	1,866
(2) Oper. expenses	751	728	787
(3) Net before taxes	1,122	1,079	1,079
(4) Taxes	204	215	239
(5) Retirements	142	142	142
(6) Oper. income	776	722	698
(7) Rent charges	10	10	10
(8) Avail. for cap. charges	766	712	688
(9) Interest	340	340	340
(10) Retirement from surplus	22	22	22
(11) Avail. for dividends	404	350	326
(12) 7% on pfd	203	203	203
(13) Avail. for common	201	147	123
(14) Rate on common, %	6.8	5.0	4.1

Source of Data

(A) Items (1) to (8) for 1932 from U. S. census.

(B) Items (9) to (15) for 1932 based on census as follows: Census gives capital stock and debt for combined services only but shows allocation of assets separately to light and power, gas, railway, etc. Assuming the portion of liabilities allocated in same ratio as assets gives for light and power:

Capital stock	$5,850,000,000
Long-term debt	5,370,000,000
Current debt	540,000,000
Total for private companies	$12,120,000,000

Since municipals add about $550,000,000 this checks with the $12,600,000,000 given elsewhere for the entire industry. Assume also that capital is equally divided between 7% preferred stock and common.

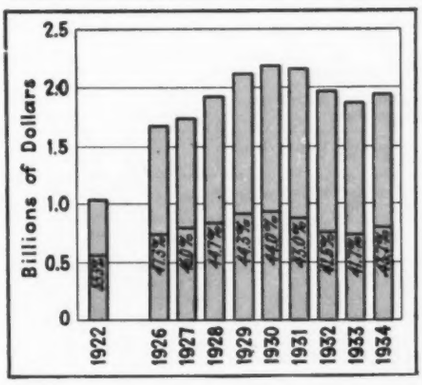
(C) Interest on combined debt (Census) is equivalent to 4.84%. Assume this also for light and power alone.

(D) Revenue of private companies for 1933 and 1934 is assumed to be in same ratio to total, including municipals, as is shown for 1932 by census.

(E) Similar assumption has been made for operating expenses, with which uncollectible bills have been included.

(F) Taxes for 1933 and 1934 are shown in another table in this article.

(G) Increase in capital investment has been ignored.



Operating expense compared with total revenue for electric service

Until 1934 operating ratio steadily decreased.

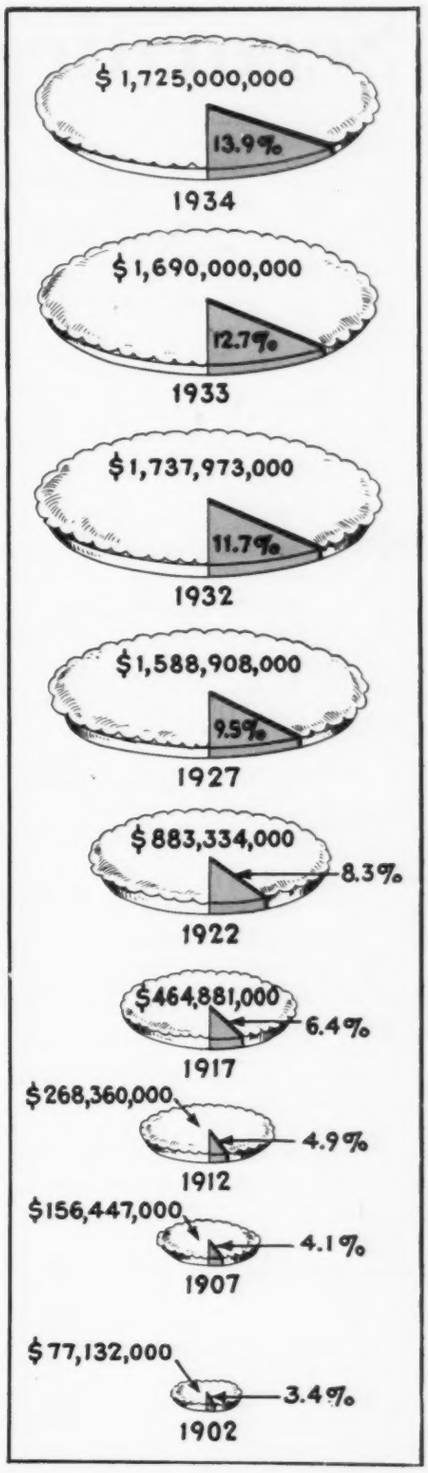
more disquieting charge on operations which cannot be overcome by any skill in management. An enormous and ever-increasing tax burden confronts the power industry, as it does the individual citizen and business in general. This burden, while still relatively easy on municipal plants, is now in the case of private companies equal to 14 per cent of the revenue received from the actual users of electrical energy.

The table of taxes here reproduced is taken, except for 1934, from a compilation by the Edison Electric Institute based on the quinquennial U. S. Census of Light and Power Companies. The tax of $239,000,000 for private companies for 1934 is probably an underestimate. It is the most conservative of the figures arrived at by different computations on the basis of information now available. Others range from $240,000,000 to $250,000,000. Thus the average householder's annual bill of $33.40 includes a tax of $4.65.

From the assembled data and with the aid of certain reasonable assumptions an approximate consolidated balance sheet can be worked out for each of the past three years, beginning with the Census for 1932. It is obvious that rising costs must lead inevitably to one of two results or to a combination of both. The steady decrease in rates which has made electrical conveniences more and more a commonplace throughout the homes of the land will be halted. Or declining returns will penalize the millions of thrifty people whose savings are directly or indirectly involved in light and power companies and so will increase the number of those who, with bitter cynicism, no longer reject with abhorrence the idea of lapsing into deliberate pauperism.

The generally excellent financial standing of electric light and power companies has in the past made them a desirable medium for the investment of accumulated savings and has enabled them to secure needed funds for expanding service. Any influence tending to jeopardize that standing is bound to bring about far-reaching readjustments and inevitable losses, hurtful to the national economy.

Utility bonds are regarded as being among the soundest of investments. They are held to the extent of more than $5,000,000,000 in various forms of trusteeship and by private individuals. They are sound because they constitute less than 50 per cent of the total investment, backed by an active and thoroughly solvent industry. This soundness will be impaired by any condition which impairs the value of the equity standing as a bulwark behind them.

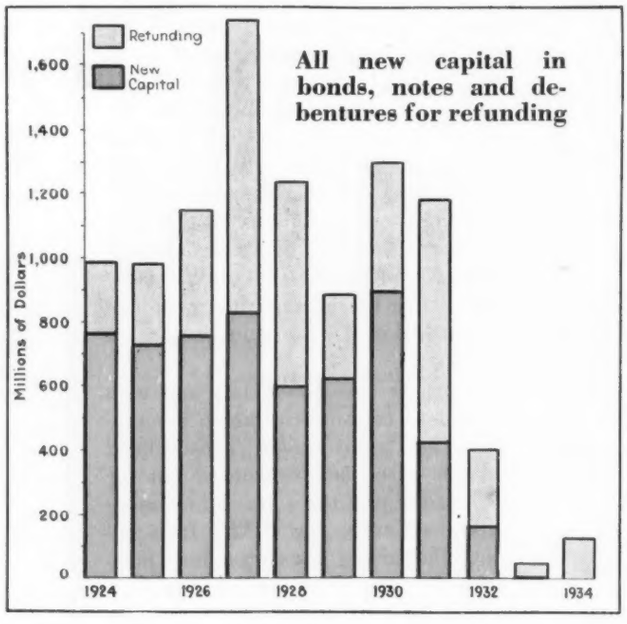


The slice gets bigger and bigger

Comparison of operating revenue and taxes, commercial companies.

Securities in Sound Recovery

New Financing Double 1933—All Was Bond and Note Refunding—Maturities of Next Year to Be Less.—Earnings Have Stood Rate Reductions



NEW financing by the electric utilities during 1934 was practically 2½ times as great as in 1933; notes were a somewhat higher proportion of the total. Of course, the total is still low in volume, only 6 per cent of the peak value of 1927, when system expansion was being demanded on a grand scale. Defaults have dropped to half their value, the operating companies showing a 50 per cent rise in their contribution, while the holding company defaults dropped to less than half their previous value. There were eleven new receiverships.

Maturities for the coming year are nearly $40,000,000 less than the 1934 total of $158,000,000. It is extremely fortunate that so little refunding has had to be done during the current period. Growth, shrewd foresight and mere accident can share the honors for the fact that an industry with some $6,000,000,000 of bonds outstanding should have only 2 per cent or so in each of these two years pop up for cashing or refunding. Stocks in general are higher by 30 to 50 per cent than they were a year ago. Some dismal lows were recorded last spring and at mid-November the top price recorded had been only of the order of ten to twelve times the ten months' earnings, speaking in terms of a broad average. In short, both the stocks and the bonds of the industry have shown a remarkable resiliency in the face of the great Culebra slide that carried all before it. This demonstrated resiliency is all the more notable in view of the supreme efforts made to push them to the bottom of the whole pile of débris now being renovated.

The general investing public took the major share of the investment is-

1934 Financing More Than Double 1933

Name of Company	Amount of Issue (Par Value)	Offered to	Period (Years)	Class	Purpose	Interest Rate	Price	Per Cent Yield
Amer. Water Works & Electric	$15,000,000	Public	10	Convertible coll. trust bonds	Refunding and other corporate purposes	5	105	4.37
Edison Elec. Illum. of Boston	35,000,000	Public	3	Notes	Refunding and to pay bank loans	3	100	3
	20,000,000	Public	3	Notes		3	100½	2.82
Western Massachusetts Cos.	8,500,000	Public	5	Notes	Refunding and other corporate purposes	4	100	4
Long Island Lighting	6,315,000	Institutional investors	21	First ref. mtge. bonds, series B	Retirement debt	5	95	5.40
Chicago Dist. Elec. Generating	10,000,000	Privately	1–10	Serial debentures	Refunding	3, 4½ and 5	.....	.....
Consumers Power	7,000,000	Institutional investors	10	First lien and unifying mtge. bonds	Refunding	4	100	4
Northern States Power	10,000,000	Public	30	Refunding mtge. bonds	Refunding to pay bank loans	5	96	5.26
Cons. Gas, Elec. Lt. & Pwr. (Balti.)	18,000,000	Institutional investors	30	First ref. mtge. bonds, series K	Refunding and other corporate purposes	3½	96	3.97
Bangor Hydro Electric	1,360,000	Institutional investors	20	First lien and ref. mtge. bonds	To meet maturing obligations	4	.....	.....
	$131,175,000							

Stocks Make Substantial Recovery

High and low values of stocks for ten months ended November 15, 1934. Earnings estimated for 1934.

	Common High	Common Low	Preferred High	Preferred Low	Earnings Common	Earnings Preferred
Associated Gas & Electric	2¼	¼	6⅜	1⅜	D	D
American & Foreign Power	13¾	4½	25	11	0.80	28.00
American Light & Traction	19⅜	9½	22	19	1.50	9.30
American Power & Light	12½	3⅜	26½	10½	D	1.50
American Water Works & Elec.	27⅛	12⅜	80	54	1.25	16.90
Cities Service	4½	1½	26⅛	11½	0.06	6.00
Columbia Gas & Electric	19¼	6⅞	78¾	52	0.40	11.00
Cons. Gas, E. L. & P., Balto	68	53	106	93	4.00	27.00
Commonwealth & Southern	3⅜	1½	52⅜	21½	Nil	5.90
Detroit Edison	84	63½	...	...	5.60	.....
Commonwealth Edison	62	34	...	...	3.90	.....
Engineers Public Service	8⅜	2½	23½	10⅛	D	1.97
Edison Elec. Illg. of Boston	154½	106½	...	...	9.50	.....
Electric Power & Light	9⅛	3	19¾	7	D	D
Consolidated Gas of N. Y.	47⅜	22⅜	95	80½	2.40	18.70
International Hydro-Elec.	9⅛	3	31¼	8¾	2.40	17.41
Louisville Gas & Electric	21	13	...	...	2.05	.....
Midland United	⅞	⅛	1⅛	⅛	D	D
North American	25½	11	45	34	1.20	19.50
Niagara Hudson Power	9⅜	3½	...	...	0.70	.....
North Amer. Lt. & Pwr.	4½	⅜	16	3½	D	D
National Pwr. & Lt.	15½	6¼	69¾	35½	0.75	23.00
Pacific Gas & Elec.	23½	12⅜	23½	18⅜	1.40	3.00
Pacific Lighting	37	20⅜	90	69	2.50	25.00
Public Serv. No. Ill.	22	10⅜	66	34	2.00	15.00
Public Service N. J.	45	29½	97⅜	79	3.10	16.50
Southern Calif. Edison	22⅜	10½	21⅜	15½	1.20	2.40
Standard Gas & Electric	17	6½	38½	17½	D	4.00
United Gas Improvement	20½	13	99⅜	86	1.15	42.00
Utilities Power & Light	5⅜	1⅜	17½	4	D	D
United Light & Power	5⅜	1½	24⅜	5½	D	1.60
West Penn. Electric	70	44½	68½	45	45.00	14.00

sues of the year, their figure being $88,500,000. Institutional investors subscribed to $32,675,000 and there was one private absorption of $10,000,000 of serial debentures of the Chicago District Electric Generating Company for refunding purposes. Notes to the extent of $63,500,000 were a bit in excess of the $57,675,000 in bonds of various description.

Issue prices ranged from 95 for a Long Island Lighting issue of $6,315,000 (to retire current debt) to 105 for the $15,000,000 of American Water Works & Electric's new convertible collateral trust bonds. Interest rates on the note issues (all by Boston and Western Massachusetts) were 3 and 4 per cent, with yields of 2.82 to 4 per cent. Interest rates on the bonds were at 4 and 5 per cent, except for the Baltimore issue of $18,000,000 at 3¾ per cent to yield 3.97 on the discount of 96. In practically all instances the objective was entirely a matter of refunding. Terms of the bonds range from ten to thirty years.

Maturities of 1935

January 1	
Flambeau Power 1st 6s A	$12,500
Northern New York Power 1st 6s	50,000
Twin City Light & Traction 1st 6s	169,000
January 14	
Staten Island Edison 6s	85,000
	$316,500
February 1	
Elko Lamoille Power 1st 7s	$5,000
Great Northern Power 1st 5s	6,589,000
Madison River Power 1st 5s	1,417,000
February 14	
Con. Gas, Elec. Lt. & Pwr. (Balto.) 4½s	13,845,000
Staten Island Edison 6s	894,000
February 15	
New England Power Ass'n. 5½ notes	360,000
	$23,110,000
March 30	
Bennington Electric 4½s	$56,000
	$56,500
April 1	
North American Lt. & Pwr. 5% notes	$2,000,000
Staten Island Edison 6s	25,000
April 14	
Staten Island Edison 6s	1,485,000
April 15	
Chasm Power 1st 5s	2,000
	$3,512,000
May 1	
Arkansas-Missouri Power deb. 6½s	$788,100
Great Lakes Power 1st 6s	140,000
Greenville-Carolina Power 1st 5s	138,000
Northwestern Electric 1st 6s	6,896,900
May 2	
Edison Elec. Illum. of Boston 5% notes	$20,000,000
	$27,963,000
June 1	
Galveston-Houston Electric 6½% notes A	$575,680
Galveston-Houston Electric 6% notes B	306,590
Inland Power & Light deb. 7s, A	1,161,900
Iowa Southern Utilities 6% notes	50,000
Marshall Lt., Heat & Pwr. 1st 5s	25,000
Middle West Utilities 5% conv. notes	10,000,000
Ohio State Power 1st 6s	736,500
	$12,855,670
July 1	
Bangor Rwy. & Elec. 1st cons. 5s	$1,102,500
East Hampton Elec. Lt. 1st 6s	60,000
Indiana Service 6s, E	8,000
Janesville Elec. 1st & ref. (now 1st) 5s	10,000
Michoacan Power 1st 6s	100,000
New Orleans Pub. Serv., Inc. gen. lien 4½s	11,808,800
Portland General Electric 1st 5s	6,615,000
	$19,704,300
August 1	
Central West Pub. Serv. 7% notes	$1,200,000
Iowa Elec. Lt. & Pwr. 7% notes	450,000
August 15	
General Gas & Elec. 5% notes	877,000
	$2,527,000
September 1	
Bar Harbor & Union River Power 1st ref. 5s	$203,000
Redlands Water & Power 1st closed 5½s	$2,000
Union Gas & Electric 1st 5s	478,000
September 15	
Trans-Mississippi Utilities 1st lien coll. conv. 6s, A	365,000
	$1,048,000
October 1	
Chicago District Elec. Gener. deb. 5½s	$7,847,000
Eastern Iowa Electric 1st 6s	64,000
Lexington Gas & Electric 1st 5s	65,000
Standard Gas & Elec. 6% conv. notes	9,826,500
Standard Gas & Elec. 6% notes	14,823,000
October 15	
Eastern Utilities Assoc. 5% notes	2,400,000
	$35,025,500
November 1	
Atchinson Ry., Lt. & Pwr. 1st & ref. 5s	$457,000
Freeport Railway & Light 1st & cons. 5s	85,900
Mountain States Power 6% conv. notes	472,200
	$1,015,100
December 1	
Colorado Utilities secured 6½s	$173,000
Iowa Southern Utilities 6% notes	50,000
December 15	
Beverly Gas & Elec. 3-yr. 4¼% notes	250,000
Suburban Gas & Elec. 3-yr. 4½% notes, B	375,000
	$848,000
Total for the year	**$127,981,570**

Every index thus points to revived confidence in these securities. When the time comes for summoning additional capital for expansion rather than for mere refunding it is going to be possible to cite the record of 1934 as indicative of what may be expected when conditions approach normal, vicious competition is put on a plane of equitable control and the trend toward objective rates builds added revenue.

Rates have been lowered by many companies after negotiation, voluntary or otherwise, with the respective state commissions. It is not possible to present any comprehensive total of the revenue reduction calculated to result from the rate adjustments made. Inquiry was addressed to 47 of the various types of commissions which have some measure of jurisdiction over electric utilities. They were asked facts about the rate revisions, capital write-downs and taxes paid by the companies.

Twelve boards gave the basis for the fragmentary data inserted here to show the activity on a geographical basis. Three commissions reported they did not have such information, two had been too recently organized to regulate electric utilities to have it and one frankly said it did not have the staff available to compile the few facts. It certainly seems that one should be able to find out how regulation is working from those who are engaged in the task.

Another index of the activity of the utilities in making lower rates is obtainable from the week by week news of new filings and new orders issued by the commissions. Not all these news reports estimate the amount of savings in dollars to the customers, but the accompanying table shows the companies which did express such an estimate. Many more companies made specific reductions in rates to some or all classes of their customers. Some were ordered to make a reduction which would carry a definite percentage reduction in revenue.

In a few of these cases the companies have asked for injunction or other stays. With all these reservations in view the total of about $15,000,000 a year represented by the items in the tabulation does give some index of response to public and political appeal for lower rates. That this figure is by no means complete is indicated by the fact that it is about one-half the reduction effected last year for residential customers alone.

Of course only a part of this reduction affected this year's revenue. Next year will see the effect, just as the extensive 1933 reductions were reflected in an equivalent grant of about $25,000,000 to the public users in homes during 1934. On the whole, this cannot be called a bad showing for the securities intimately associated with the rendition of electric service. With all the drive for new load that will be made, next year looks distinctly favorable, even with such a slice of revenue pared from present volume of revenue.

Reverting to the financing that will have to be met next year while this year's revenue adjustments are having their effect, it does not appear that there will be any pronounced change in policy from that exhibited in 1934. Among the larger issues that mature will be $13,845,000 of the 4½s of the Baltimore company, $20,000,000 of 5 per cent notes of Boston Edison, $10,000,000 of Middle West Utilities 5 per cent convertible notes, $11,808,800 of New Orleans Public Service 4½ per cent general liens and $14,823,000 of Standard Gas & Electric Company 6 per cent notes.

Defaults of 1934

Holding Companies		Defaulted
$9,264,100	American Elec. Pwr. conv. 6s	March
3,334,000	American States Pub. Serv. deb. 6s	June
6,000,000	Midland Utilities deb. 6s	September
4,339,000	Rochester Central Pwr. deb. 5s	March
6,730,000	United Public Utilities A 6s	April
6,555,800	United Pub. Utilities, 1st B 5½s	April
1,220,000	United Pub. Utilities, 1st C 6s	April
$37,442,900		
Operating Companies		
$1,500,000	Pecos Valley P. & L. 6½s	November
8,828,000	Seattle Lighting ref. 5s	October
622,000	Seattle Lighting ref. 8s	October
1,229,000	Seattle Lighting deb. 6s	August
$12,179,000		
$49,621,900		

Receiverships of 1934

American Electric Power Corporation
Arizona Power Company
Central Public Service Corporation
Inland Power & Light Company
Kentucky Securities Corporation
Middle West Utilities Company
Pecos Valley Power & Light Company
Portland Electric Power Company
Southern Cities Public Service Company
Southern Cities Public Utilities Company
Union Power Corporation

Rate Reductions Reported by Regulatory Commissions

	Revenue Reduction	Customers Affected	Companies Affected
Alabama	$200,000	100,000	7
Arkansas	400,000	80,000	5
D. of Columbia	380,000	153,000	1
Georgia	1,400,000	174,600	5
Idaho	34,000	Irrigation	..
Illinois	1,625,000	.....	2
Maine	80,000	27,000	1
Maryland	33,000*	11,500	..
No. Carolina	1,224,000	148,711	5
Ohio	4,329,200	387,397	10
So. Carolina	1,407,993	70,000	10
Wisconsin	480,000	163,000†	36

*Following 1933 reduction of $950,000.
†The item includes customers of 33 municipals whose rates were cut about $192,000.

Rate Reductions in the 1934 News

West. Tenn. Power & Light	$50,000
Savannah Elec. & Power	170,000
Virginia Elec. Power	366,300
Kansas Power & Light	80,000
Syracuse Lighting	119,000
Tonawanda Power (N. Y.)	24,000
Buffalo General Elec	135,000
Des Moines Electric Light	225,800
Tennessee Electric Power	172,000
Interstate Power (Iowa)	35,000
United Electric Light (Mass.)	85,000
Kansas Power	3,500
New Orleans Public Service	653,123
Kingsport Utilities (Tenn.)	11,000
Missouri Utilities	22,000
Staten Island Edison	120,000
Alabama Power	553,000
Missouri General Utilities	14,000
New York State Gas & Elec	15,000
Public Service of Indiana	800,000
Public Service of No. Ill	1,300,000
Central Arizona Light & Power	200,000
Mississippi Power & Light	40,000
Eastern Shore Pub. Serv. (Md.)	45,000
Worcester Electric Light (Mass.)	100,000
Oklahoma Gas & Electric	200,000
Arkansas Power & Light	225,000
Gloucester Elec. Light (Mass.)	11,200
Six upper New York Cos	248,000
Public Service of Okla	20,000
Home Gas & Electric (Col.)	53,180
Georgia Power & Light	66,000
Union Gas & Electric (Ohio)	1,800,000*
United Power & Light (Kan.)	300,000
Central Hudson Gas & Elec	118,000
Edison Elec. Ill. of Boston	800,000
Duke Power Company	1,337,000†
Dallas Power & Light	400,500
Appalachian Elec. Power (Va.)	186,000
Broad River Power (S.C.)	127,000
Columbus Ry. Light & Power	735,000
Dayton Power & Light	1,827,580‡
Northern States Power (Minn.)	350,000
Bronx Gas & Electric	520,000
Virginia Public Service	77,700
Northern Pennsylvania Power	100,000
Yonkers Electric Light & Power	140,000
Sixteen Pennsylvania Companies	1,413,829

*Covers four-year period. †Includes some gas.
‡Covers five-year period.

OUTSTANDING FACTS

Figures are on electric light and power industry for the year's operations or as of the end of each year.

	1927	1928	1929	1930	1931	1932	1933	*1934
CAPITAL invested ($1,000)	9,500,000	10,300,000	11,100,000	11,800,000	12,400,000	12,600,000	12,800,000	12,900,000
Securities sold ($1,000)	2,152,527	1,653,180	1,468,895	1,591,986	1,491,742	465,921	56,248	129,815
By investment houses ($1,000)	[3]1,889,000	[3]1,471,498	[3]1,315,459	[3]1,452,854	[3]1,341,742	[3]1,341,742	[3]55,873	[2]129,815
Direct to customers ($1,000)	263,527	181,682	153,436	139,132	150,000	18,000	375	.....
REVENUE, for elec. service ($1,000)	1,802,655	1,941,955	2,105,900	2,151,150	2,125,110	1,979,990	1,906,110	1,966,000
From ultimate consumers ($1,000)	1,661,032	1,784,309	1,938,520	1,990,955	1,975,944	1,832,596	1,773,416	1,833,250
Domestic ($1,000)	523,689	571,620	618,799	664,441	678,611	669,200	656,570	675,000
Small light and power ($1,000)	482,136	519,957	555,640	575,598	564,524	528,861	499,684	510,000
Large light and power ($1,000)	519,074	549,989	613,171	590,992	570,127	476,451	465,191	496,000
Municipal ltg. and misc. ($1,000)	82,996	90,695	98,646	107,841	114,045	113,952	109,462	107,500
Railways and railroads ($1,000)	53,137	52,048	52,264	52,083	48,637	44,132	42,809	44,750
Other sources ($1,000)	141,623	157,646	167,380	160,195	149,166	147,394	132,694	132,750
EXPENDITURES								
Additions and extensions ($1,000)	760,353	786,977	866,344	960,890	633,415	260,000	180,000	170,000
Operating, total[1] ($1,000)	828,168	866,350	934,890	946,180	913,910	[7]817,950	795,811	858,000
Salaries and wages ($1,000)	390,000	.....	.....	.....	.....	[7]323,822	292,000	317,000
Taxes ($1,000)	157,000	.....	.....	.....	.....	[7]205,151	.....	240,300
ENERGY (1,000,000 kw.-hr.)								
Output, central stations	74,686	82,927	91,421	89,952	86,312	77,868	79,983	84,895
From fuel	45,968	49,419	59,031	59,388	57,742	45,991	47,533	54,203
From water power	28,718	33,508	32,390	30,562	28,570	31,877	32,450	30,692
Total; incl. imported and purchased	76,369	83,394	92,757	91,957	88,400	79,505	81,913	87,140
SYSTEMS, STATIONS								
Number of establishments	4,335	4,063	[8]2,801	[8]2,755	[8]2,596	[7]3,429	.....	.....
Commercial establishments	2,137	2,153	[8]1,480	[8]1,379	[8]1,308	[7]1,627	.....	.....
Municipal establishments	2,198	1,910	[8]1,321	[8]1,376	[8]1,288	[7]1,802	.....	.....
Companies generating	2,331	2,394	[8]1,699	[8]1,575	[8]1,686	[7]1,788	.....	.....
Companies purchasing all energy	2,004	1,669	[8]1,102	[8]1,180	[8]910	[7]1,641	.....	.....
No. 100,000,000 kw.-hr. systems	124	135	137	142	142	138	137	.....
Transmission (circuit miles)	185,449	[6]173,797	[6]184,931	[6]200,171	[6]208,457	[6]208,097	.....	.....
Generating plants, all central station	4,801	4,352	4,250	[8]3,873	[8]3,746	4,339	4,292	4,438
Commercial	3,589	3,232	3,190	2,863	.....	.....	.....	.....
Municipal	1,212	1,120	1,060	1,010	.....	.....	.....	.....
RATINGS								
Generator rating (kw.)	25,811,305	27,698,305	29,558,637	31,976,138	33,483,821	34,010,137	33,970,602	33,765,000
Prime movers (hp.)	35,710,128	38,544,800	41,531,800	44,747,000	47,112,000	[7]47,966,962	47,940,600	47,646,800
Steam engines and turbines (hp.)	25,317,577	27,360,000	29,512,000	31,540,000	32,250,000	[7]33,553,634	33,442,600	33,106,000
Water wheels (hp.)	9,844,263	11,119,800	11,439,000	12,540,000	14,155,000	[7]13,532,027	13,601,000	13,619,000
Internal combustion engines (hp.)	548,288	575,000	600,000	667,000	707,000	[7]881,301	897,600	921,000
FUEL CONSUMPTION								
Coal and coke (short tons)	37,500,630	37,593,322	41,406,000	39,702,000	35,690,336	27,589,000	28,039,000	31,142,000
Oil (bbl.)	7,145,798	6,852,352	9,740,000	8,950,000	7,898,629	7,269,000	9,446,000	9,948,000
Gas (million cu. ft)	65,523	77,054	112,442	119,457	138,483	107,138	101,000	131,000
ENERGY DISPOSITION								
Sales, ult. users (1,000,000 kw.-hr.)	61,251	66,988	75,294	74,906	71,902	63,764	65,754	70,730
Domestic	7,676	8,619	9,773	11,018	11,738	11,987	11,960	12,750
Small power and light	10,766	11,692	13,106	13,944	13,544	12,932	12,475	13,100
Large power and light	35,263	38,903	44,326	41,621	38,451	31,186	33,723	36,950
Municipal lighting and misc	2,003	2,223	2,450	2,735	2,994	2,944	2,931	2,880
Railways and railroads	5,543	5,551	5,640	5,588	5,175	4,715	4,665	5,050
Company railway depts	1,348	1,330	1,279	1,184	970	843	699	640
Company use and losses	13,770	15,077	16,184	15,867	15,528	14,898	15,460	15,770
CUSTOMERS AND EMPLOYEES								
Customers, total	21,786,212	23,153,252	24,147,183	24,555,732	24,489,770	24,149,300	24,295,515	24,855,989
Domestic lighting	17,950,934	19,089,882	19,967,154	20,331,551	20,151,247	19,849,963	20,004,098	20,520,870
Small light and power	3,358,140	3,532,489	3,598,115	3,628,653	3,724,013	3,687,636	3,697,324	3,734,293
Large light and power and other	477,138	530,881	581,914	595,528	614,510	611,701	594,093	600,826
People in electric lighted homes	75,500,000	80,300,000	82,000,000	83,400,000	82,700,000	82,500,000	82,500,000	85,800,000
Per cent of total population	63.0	67.5	68.0	68.2	67.4	67.0	66.7	68.1
Employees, total	251,020	265,000	289,000	298,000	262,000	244,573	228,000	247,000

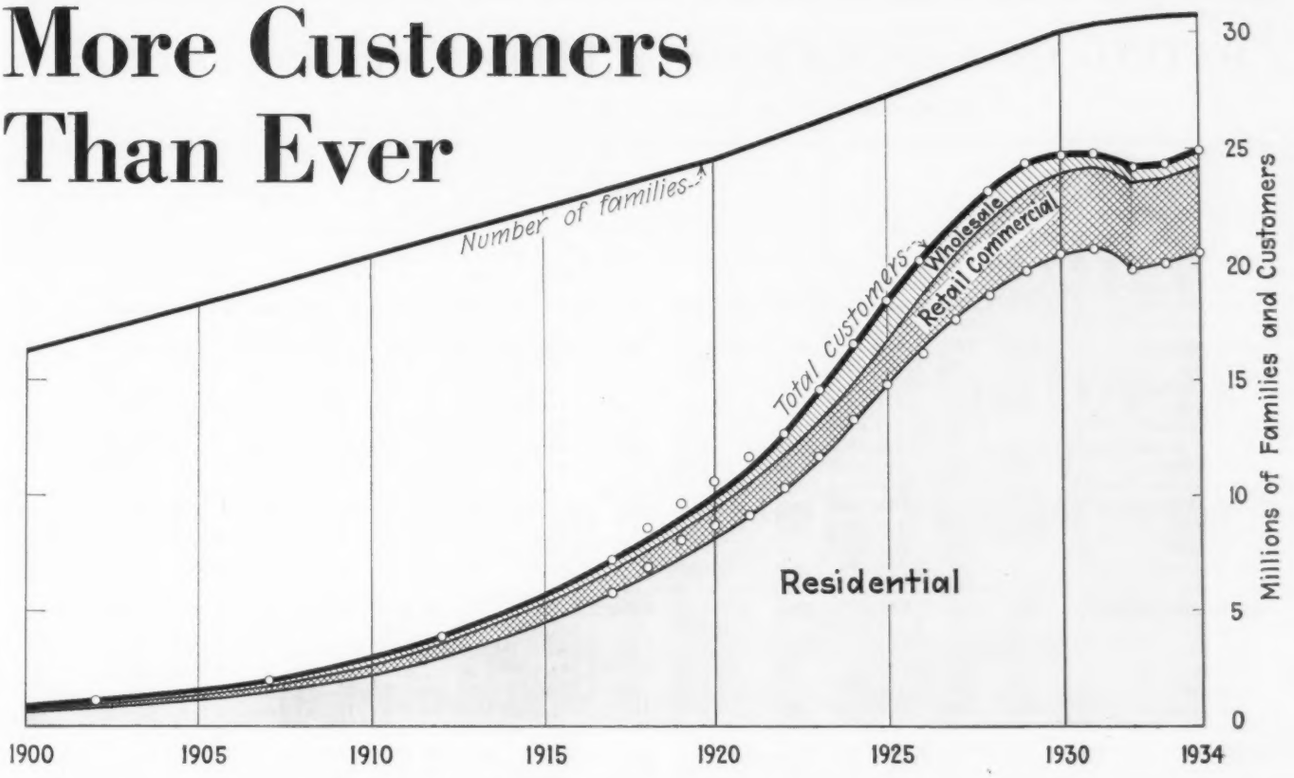
* Estimated, generally on ten months' operations.
[1] Does not include interest, taxes, depreciation or sinking fund.
[2] Includes institutional investors.
[3] Includes rights.
[4] Includes estimated value of free service, $5,267,000.
[6] 11,000 volts or over.
[7] Census.
[8] Very small ones omitted.

CENTRAL-STATION CUSTOMERS at End of Year

Region or State	Total Number				Domestic Service*				Commercial Lighting and Small Power				Wholesale Power and Miscellaneous			
	1932	1933	1934	Change in 1934	1932	1933	1934	Change in 1934	1932	1933	1934	Change in 1934	1932	1933	1934	Change in 1934
UNITED STATES	**24,149,300**	**24,295,515**	**24,855,989**	**+560,474**	**19,849,963**	**20,004,098**	**20,520,870**	**+516,772**	**3,687,636**	**3,697,324**	**3,734,293**	**+36,969**	**611,701**	**594,093**	**600,826**	**+6,733**
NEW ENGLAND	**2,194,756**	**2,207,673**	**2,236,139**	**+28,466**	**1,841,188**	**1,856,790**	**1,885,650**	**+28,860**	**309,777**	**308,324**	**308,007**	**−317**	**43,791**	**42,559**	**42,482**	**−67**
Maine	192,628	194,563	195,478	+915	155,849	157,972	158,765	+793	31,022	31,054	31,006	−48	5,757	5,537	5,707	+170
New Hampshire	119,746	121,181	124,380	+3,199	100,231	101,898	104,934	+3,036	15,782	15,663	15,744	+81	3,733	3,620	3,702	+82
Vermont	79,893	80,445	80,495	+50	65,652	66,109	66,292	+183	11,591	11,653	11,566	−87	2,650	2,683	2,637	−46
Massachusetts	1,165,760	1,172,230	1,189,305	+17,075	975,683	984,473	1,002,661	+18,188	170,810	169,306	168,532	−774	19,267	18,451	18,122	−329
Rhode Island	188,774	189,529	189,597	+68	160,875	161,472	161,680	+208	24,481	24,608	24,413	−195	3,418	3,449	3,504	+55
Connecticut	447,955	449,725	456,884	+7,159	382,898	384,866	391,318	+6,452	56,091	56,040	56,746	+706	8,966	8,819	8,820	+1
MIDDLE ATLANTIC	**7,032,459**	**7,064,149**	**7,164,267**	**+100,118**	**5,793,098**	**5,813,347**	**5,908,806**	**+95,459**	**1,119,026**	**1,148,440**	**1,154,011**	**+5,571**	**120,335**	**102,362**	**101,450**	**−912**
New York	3,824,309	3,834,212	3,856,423	+22,211	3,098,733	3,095,758	3,118,968	+23,210	690,862	703,038	700,929	−2,109	34,714	35,416	36,526	+1,110
New Jersey	1,167,396	1,174,562	1,194,910	+20,348	975,524	984,033	1,002,842	+18,809	152,622	153,508	156,741	+3,223	39,250	37,021	35,327	−1,694
Pennsylvania	2,040,754	2,055,375	2,112,934	+57,559	1,718,841	1,733,556	1,786,996	+53,440	275,542	291,894	296,341	+4,447	46,371	29,925	29,597	−328
EAST NORTH CENTRAL	**5,645,214**	**5,669,117**	**5,814,291**	**+145,174**	**4,773,734**	**4,813,944**	**4,958,413**	**+144,469**	**795,874**	**780,669**	**781,515**	**+846**	**75,606**	**74,504**	**74,363**	**−141**
Ohio	1,488,328	1,499,336	1,537,141	+37,805	1,280,711	1,294,190	1,330,520	+36,330	187,393	185,288	187,159	+1,871	20,224	19,858	19,462	−396
Indiana	662,560	668,167	678,278	+10,111	559,659	565,421	574,312	+8,891	87,913	88,443	89,576	+1,133	14,988	14,303	14,390	+87
Illinois	1,817,642	1,813,711	1,848,615	+34,904	1,536,375	1,543,001	1,581,058	+38,057	258,566	247,992	244,845	−3,147	22,701	22,718	22,712	−6
Michigan	1,042,720	1,047,840	1,095,458	+47,618	879,776	887,732	934,839	+47,107	159,165	156,380	156,851	+471	3,779	3,728	3,768	+40
Wisconsin	633,964	640,063	654,799	+14,736	517,213	523,600	537,684	+14,084	102,837	102,566	103,084	+518	13,914	13,897	14,031	+134
WEST NORTH CENTRAL	**2,325,171**	**2,327,590**	**2,366,771**	**+39,181**	**1,921,293**	**1,925,345**	**1,960,659**	**+35,314**	**358,474**	**356,695**	**359,166**	**+2,471**	**45,404**	**45,550**	**46,946**	**+1,396**
Minnesota	480,563	481,603	495,376	+13,773	395,215	395,883	408,529	+12,646	66,251	66,103	66,518	+415	19,097	19,617	20,329	+712
Iowa	450,841	450,389	457,117	+6,728	380,791	380,231	386,306	+6,075	65,514	65,646	66,226	+580	4,536	4,512	4,585	+73
Missouri	664,143	667,911	677,856	+9,945	551,940	556,470	565,821	+9,351	107,343	106,615	107,271	+656	4,860	4,826	4,764	−62
North Dakota	68,794	69,197	70,476	+1,279	49,908	50,222	51,394	+1,172	16,415	16,445	16,472	+27	2,471	2,530	2,610	+80
South Dakota	83,176	83,475	85,054	+1,579	63,954	64,342	65,743	+1,401	15,078	15,015	15,150	+135	4,144	4,118	4,161	+43
Nebraska	237,100	236,331	239,220	+2,889	195,922	195,667	198,753	+3,086	35,112	34,988	34,746	−242	6,066	5,676	5,721	+45
Kansas	340,554	338,684	341,672	+2,988	283,563	282,530	284,113	+1,583	52,761	51,883	52,783	+900	4,230	4,271	4,776	+505
SOUTH ATLANTIC	**1,779,566**	**1,807,764**	**1,892,916**	**+85,152**	**1,467,155**	**1,495,546**	**1,573,849**	**+78,303**	**287,750**	**286,712**	**294,398**	**+7,686**	**24,661**	**25,506**	**24,669**	**−837**
Delaware	48,636	49,734	50,583	+849	40,169	40,840	41,740	+670	7,928	8,076	8,147	+71	539	588	696	+108
Maryland	325,100	332,569	346,486	+13,917	283,862	291,307	304,892	+13,585	39,304	39,358	39,671	+313	1,934	1,904	1,923	+19
Dist. of Columbia	131,728	132,350	138,838	+6,488	114,750	115,081	121,207	+6,126	16,861	17,131	17,498	+367	117	138	133	−5
Virginia	266,457	267,917	277,056	+9,139	218,334	220,627	229,396	+8,769	43,035	42,480	42,863	+383	5,088	4,810	4,797	−13
West Virginia	188,827	193,869	207,729	+13,860	153,721	159,405	171,702	+12,297	31,715	31,026	32,581	+1,555	3,391	3,438	3,446	+8
North Carolina	260,267	264,213	269,277	+5,064	215,031	218,898	223,323	+4,425	39,671	39,786	40,302	+516	5,565	5,529	5,652	+123
South Carolina	108,413	109,617	112,239	+2,622	85,687	87,170	89,528	+2,358	20,895	20,656	20,858	+202	1,831	1,791	1,853	+62
Georgia	208,886	212,936	229,102	+16,166	163,435	166,190	180,647	+14,457	43,803	45,075	46,718	+1,643	1,648	1,671	1,737	+66
Florida	241,252	244,559	261,606	+17,047	192,166	195,798	211,414	+15,616	44,538	43,124	45,760	+2,636	4,548	5,637	4,432	−1,205
EAST SOUTH CENTRAL	**781,749**	**791,963**	**832,380**	**+40,417**	**624,379**	**636,625**	**674,040**	**+37,415**	**142,463**	**141,371**	**144,304**	**+2,933**	**14,907**	**13,967**	**14,036**	**+69**
Kentucky	275,488	277,213	284,904	+7,691	223,341	225,873	232,988	+7,115	43,443	42,827	43,504	+677	8,704	8,513	8,412	−101
Tennessee	243,144	241,912	256,265	+14,353	195,756	195,664	210,029	+14,365	44,816	43,758	43,615	−143	2,572	2,490	2,621	+131
Alabama	171,168	177,991	190,926	+12,935	136,738	143,734	155,396	+11,662	32,817	33,266	34,541	+1,275	1,613	991	989	−2
Mississippi	91,949	94,847	100,285	+5,438	68,544	71,354	75,627	+4,273	21,387	21,520	22,644	+1,124	2,018	1,973	2,014	+41
WEST SOUTH CENTRAL	**1,245,161**	**1,263,108**	**1,316,324**	**+53,216**	**964,239**	**982,256**	**1,025,120**	**+42,864**	**230,771**	**230,383**	**239,708**	**+9,325**	**50,151**	**50,469**	**51,496**	**+1,027**
Arkansas	118,307	117,662	121,554	+3,892	88,613	88,188	91,055	+2,867	24,348	24,153	25,125	+972	5,346	5,321	5,374	+53
Louisiana	197,990	200,016	206,065	+6,049	160,322	161,993	164,893	+2,900	32,281	31,930	34,995	+3,065	5,387	6,093	6,177	+84
Oklahoma	268,114	269,858	279,731	+9,873	203,307	205,311	214,477	+9,166	47,205	47,194	47,287	+93	17,602	17,353	17,967	+614
Texas	660,750	675,572	708,974	+33,402	511,997	526,764	554,695	+27,931	126,937	127,106	132,301	+5,195	21,816	21,702	21,978	+276
MOUNTAIN	**628,829**	**634,349**	**653,205**	**+18,856**	**479,034**	**482,779**	**499,090**	**+16,311**	**92,331**	**92,616**	**94,101**	**+1,485**	**57,464**	**58,954**	**60,014**	**+1,060**
Montana	85,798	87,194	91,416	+4,222	66,952	68,295	71,817	+3,522	15,348	15,366	16,012	+646	3,498	3,533	3,587	+54
Idaho	76,898	78,517	82,297	+3,780	52,131	53,295	56,068	+2,773	11,715	11,801	12,177	+376	13,052	13,421	14,052	+631
Wyoming	32,717	32,776	33,254	+478	25,612	25,697	26,402	+705	5,863	5,856	5,713	−143	1,242	1,223	1,139	−84
Colorado	204,828	204,220	207,145	+2,925	161,543	161,330	163,897	+2,567	28,942	28,607	28,839	+232	14,343	14,283	14,409	+126
New Mexico	34,244	34,754	35,218	+464	25,946	26,427	26,747	+320	6,250	6,275	6,414	+139	2,048	2,052	2,057	+5
Arizona	69,256	70,268	72,968	+2,700	52,694	53,008	55,491	+2,483	9,801	9,831	9,918	+87	6,761	7,429	7,559	+130
Utah	107,721	109,128	112,484	+3,356	80,878	81,414	84,433	+3,019	11,315	11,711	11,852	+141	15,528	16,003	16,199	+196
Nevada	17,367	17,492	18,423	+931	13,278	13,313	14,235	+922	3,097	3,169	3,176	+7	992	1,010	1,012	+2
PACIFIC	**2,516,395**	**2,529,802**	**2,579,696**	**+49,894**	**1,985,843**	**1,997,466**	**2,035,243**	**+37,777**	**351,170**	**352,114**	**359,083**	**+6,969**	**179,382**	**180,222**	**185,370**	**+5,148**
Washington	416,805	424,377	434,216	+9,839	320,405	322,017	329,771	+7,754	55,858	59,804	59,974	+170	40,542	42,556	44,471	+1,915
Oregon	234,059	236,927	245,760	+8,833	180,778	183,052	190,115	+7,063	33,681	33,676	34,307	+631	19,600	20,199	21,338	+1,139
California	1,865,531	1,868,498	1,899,720	+31,222	1,484,660	1,492,397	1,515,357	+22,960	261,631	258,634	264,802	+6,168	119,240	117,467	119,561	+2,094

*Farm customers included with domestic except in irrigated regions. Farms in West South Central, Mountain and Pacific states included with wholesale commercial. See text.

More Customers Than Ever



ELECTRIC service now reaches more people in the United States than ever before. Until 1930 the number of customers continually increased, so that by the end of that year the total was 24,556,000 and the number of domestic users 20,332,000.

That was the peak. With 1931 came scattering recessions. Families were "doubling up." Dwellings were being vacated. The year's net decrease was small, about 66,000 customers, although many of the states still showed gains.

During 1932 the loss was larger and more widespread; it came to 340,000 customers and affected all but a few states. The low point came in May, 1933. By the end of the year the decline of the earlier months had been more than made up and the year ended with 146,000 more customers than at its beginning. The rise from the low point exceeded 200,000.

Now comes 1934, with an estimated increase during the year of 560,000 customers. Contrasted with the losses a few years ago, every state enjoyed an increase. The new total of 24,856,000 surpassed the previous maximum by 300,000.

Domestic customers now number 20,520,870, or 82.5 per cent of the total, with an increase during the year of 516,772. This includes farm customers except in the irrigated section of the country, assumed to be in the Southwest and the two Western geographical regions, where energy consumption for agriculture is far greater than elsewhere, and where farms have been included with wholesale and miscellaneous. Of small commercial power users there are 3,734,293, or 15 per cent of the total, an increase by 36,969. The remaining 600,826 are wholesale, street lighting and miscellaneous users.

Farm customers are the only group revealing a steady gain throughout the depression. The total of 731,675 marks an increase of 12.5 per cent over 1930, and a gain during 1934 of about 18,000.

Number of Farm Service Customers

(As of December 31)

Region	1934	1933	1932	1931	1930
United States	**731,675**	**713,558**	**705,075**	**698,786**	**649,919**
New England	57,107	55,725	52,923	52,237	48,996
Middle Atlantic	111,638	109,001	106,759	104,911	96,342
East North Central	178,780	172,467	170,421	166,893	151,113
West North Central	90,271	89,460	89,652	89,717	82,283
South Atlantic	51,957	50,558	49,080	47,958	42,539
East South Central	31,028	30,311	31,947	31,513	29,949
West South Central	22,594	22,371	22,653	22,170	21,438
Mountain	47,515	46,516	45,026	44,308	42,536
Pacific	140,785	137,149	136,614	139,079	134,723

Growth in Farm Electrification

(Figures on Electrified Farms Do Not Include Those with Individual Lighting Plants)

Year	Total Number of Farms	Electrified Farms (Dec. 31)	Per Cent of Total
1900	5,737,372		
1910	6,361,502	(Data Not	
1920	6,448,343	Available)	
1921	.....		
1922	.....		
1923	.....	177,561	2.8
1924	.....	204,780	3.2
1925	6,371,640	246,150	3.9
1926	.....	309,125	4.9
1927	.....	393,221	6.2
1928	.....	506,242	8.0
1929	.....	576,168	9.2
1930	6,288,648	649,919	10.4
1931	.....	698,786	11.1
1932	.....	709,449	11.3
1933	.....	713,558	11.4
1934	.....	731,675	11.6

RATING OF GENERATORS in Public Utility Power Plants*

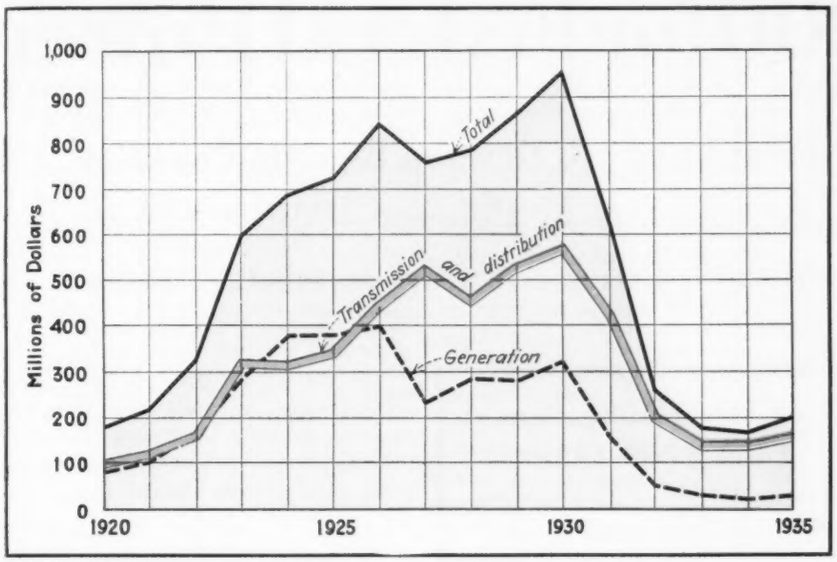
November, 1934—By Courtesy of United States Geological Survey

Division and State	Companies†	Plants	Total Capacity, Kw.	Generator Capacity of Plants Operated By										
				One Type of Prime Mover						Combination of Two or More Types				
				Water Power		Steam Power		Internal Comb. Engines		Total		Water Power	Steam Power	Int. Comb. Engines
				No.	Kw.	No.	Kw.	No.	Kw.	No.	Kw.	Kw.	Kw.	Kw.
United States	**1,590**	**3,819**	**35,832,878**	**1,346**	**9,533,450**	**1,338**	**24,977,056**	**851**	**399,469**	**284**	**922,903**	**263,060**	**543,810**	**116,033**
New England	**141**	**326**	**1,910,152**	**215**	**789,194**	**75**	**1,999,230**	**7**	**6,461**	**29**	**115,267**	**24,933**	**87,890**	**2,444**
Maine	27	78	266,082	66	213,105	6	49,730	2	707	4	2,540	1,196	800	544
New Hampshire	13	52	280,213	37	218,138	6	36,455	1	480	8	25,140	4,150	20,050	940
Vermont	26	73	175,463	63	159,551	4	10,500	0	0	6	5,412	2,502	2,910	0
Massachusetts	51	78	1,347,839	26	118,320	42	1,168,565	3	4,049	7	56,905	14,405	41,540	960
Rhode Island	3	7	242,950	3	1,750	4	241,200	0	0	0	0	0	0	0
Connecticut	21	38	597,605	20	78,330	13	492,780	1	1,225	4	25,270	2,680	22,590	0
Middle Atlantic	**151**	**416**	**9,186,910**	**202**	**1,378,116**	**162**	**7,611,010**	**23**	**23,729**	**29**	**174,055**	**126,380**	**37,430**	**10,245**
New York	77	249	5,406,359	166	1,134,476	63	4,239,145	4	11,775	16	20,963	7,565	4,375	9,023
New Jersey	13	25	1,042,455	3	950	16	1,031,450	3	2,140	3	7,915	5,100	2,700	115
Pennsylvania	61	142	2,738,096	33	242,690	83	2,340,415	16	9,814	10	145,177	113,715	30,355	1,107
East North Central	**306**	**666**	**7,921,699**	**260**	**627,335**	**321**	**7,049,719**	**42**	**21,857**	**43**	**222,788**	**19,999**	**191,573**	**11,216**
Ohio	68	105	2,148,905	8	9,380	86	2,062,821	7	2,384	4	74,320	2,770	71,350	200
Indiana	55	107	1,051,082	19	30,045	77	1,008,183	9	6,179	2	6,675	3,200	3,260	215
Illinois	59	101	2,325,223	14	42,315	72	2,195,159	9	2,429	6	85,320	3,910	77,905	3,505
Michigan	62	184	1,554,355	117	310,292	45	1,226,020	12	6,819	10	11,224	2,601	4,420	4,203
Wisconsin	62	169	842,134	102	235,303	41	557,536	5	4,046	21	45,249	7,518	34,638	3,093
West North Central	**382**	**754**	**2,684,551**	**112**	**468,159**	**256**	**1,933,021**	**314**	**140,426**	**72**	**142,945**	**15,013**	**94,027**	**33,905**
Minnesota	58	122	587,196	41	151,534	53	421,210	15	6,059	13	8,393	2,238	2,912	3,243
Iowa	72	157	592,911	27	147,400	67	346,881	47	24,771	16	73,859	6,903	59,861	7,095
Missouri	61	102	708,103	7	149,745	38	527,705	49	25,039	8	5,614	0	1,879	3,735
North Dakota	16	37	75,217	0	0	17	69,723	19	4,944	1	550	0	250	300
South Dakota	25	54	65,589	5	4,200	11	35,935	36	14,163	2	11,291	0	8,520	2,771
Nebraska	72	149	253,917	24	8,865	39	204,336	65	22,186	21	18,530	3,905	4,113	10,512
Kansas	78	133	401,618	8	6,415	31	327,231	83	43,264	11	24,708	1,967	16,492	6,249
South Atlantic	**163**	**433**	**4,358,399**	**148**	**1,888,275**	**160**	**2,301,439**	**94**	**42,243**	**31**	**126,442**	**42,075**	**76,455**	**7,912**
Delaware	6	6	8,515	0	0	4	7,600	2	915	0	0	0	0	0
Maryland	13	25	619,112	4	271,985	11	341,960	8	2,997	2	2,170	0	770	1,400
Dist. of Columbia	2	3	222,400	1	2,400	2	220,000	0	0	0	0	0	0	0
Virginia	26	71	466,240	33	81,888	18	304,949	11	4,125	9	75,278	15,069	59,550	659
West Virginia	17	41	563,084	6	55,920	24	501,670	8	4,450	3	1,044	535	62	447
North Carolina	30	82	999,257	48	642,447	22	342,850	7	4,219	5	9,741	6,291	2,000	1,450
South Carolina	15	43	647,796	24	489,738	12	135,115	4	680	3	22,263	16,200	5,973	90
Georgia	20	69	467,479	29	329,647	31	128,594	7	1,758	2	7,480	3,780	3,500	200
Florida	34	93	364,516	3	14,250	36	318,701	47	23,099	7	8,466	200	4,600	3,666
East South Central	**83**	**218**	**1,665,208**	**31**	**881,486**	**94**	**717,359**	**80**	**23,785**	**13**	**42,578**	**23,415**	**16,822**	**2,341**
Kentucky	21	44	333,044	3	104,860	28	225,122	8	1,197	5	1,865	315	825	725
Tennessee	27	62	426,111	18	186,576	27	197,052	13	3,491	4	38,992	23,100	15,300	592
Alabama	11	38	840,622	10	590,050	16	246,315	12	4,257	0	0	0	0	0
Mississippi	24	74	65,431	0	0	23	48,870	47	14,840	4	1,721	0	697	1,024
West South Central	**152**	**403**	**1,772,381**	**23**	**100,515**	**129**	**1,509,311**	**224**	**110,150**	**27**	**52,405**	**1,000**	**32,439**	**18,966**
Arkansas	19	59	148,491	5	66,855	30	73,291	20	4,741	4	3,604	0	1,294	*2,310
Louisiana	31	56	311,032	0	0	13	290,065	41	19,542	2	1,425	0	712	713
Oklahoma	48	98	338,068	2	1,500	31	300,810	57	30,798	8	4,960	200	1,747	3,013
Texas	54	190	974,790	16	32,160	55	845,145	106	55,069	13	42,416	800	28,686	12,930
Mountain	**134**	**318**	**1,191,643**	**154**	**777,289**	**82**	**354,712**	**55**	**22,941**	**27**	**36,701**	**5,716**	**5,794**	**25,191**
Montana	7	28	310,599	15	299,610	7	7,863	3	1,448	3	1,678	268	445	965
Idaho	18	48	226,980	41	222,990	3	1,100	1	1,300	3	1,590	980	0	610
Wyoming	20	35	43,527	8	15,580	17	24,307	9	2,940	1	700	400	300	0
Colorado	28	68	233,888	21	53,652	33	172,791	9	5,151	5	2,294	1,344	175	775
New Mexico	17	29	85,911	1	200	12	76,861	12	4,399	4	4,451	808	1,617	2,026
Arizona	19	44	143,621	11	87,050	9	30,790	17	4,870	7	20,911	0	2,657	18,254
Utah	20	55	135,790	50	89,312	1	41,000	2	1,833	2	3,645	1,520	0	2,125
Nevada	5	11	11,327	7	8,895	0	0	2	1,000	2	1,432	396	600	436
Pacific	**78**	**285**	**4,141,935**	**201**	**2,623,081**	**59**	**1,501,255**	**12**	**7,877**	**13**	**9,722**	**4,529**	**1,380**	**3,813**
Washington	28	70	893,134	45	706,434	15	182,270	2	173	8	4,257	2,299	880	1,078
Oregon	21	64	336,954	40	174,454	15	155,710	5	1,690	4	5,100	2,030	500	2,570
California	29	151	2,911,847	116	1,742,193	29	1,163,275	5	6,014	1	365	200	0	165

*The table relates to all public utility plants of 100 kw. or larger. This is a more comprehensive classification than electric light and power; it embraces also electric railway and other plants generating energy used for public utility purposes.

The omission of the very small plants does not appreciably affect the aggregate rating or output. In 1932 these numbered about 600. The number of small operating companies or establishments correspondingly omitted in 1932 was somewhat over 400.

†Only companies that have generating plants. Excludes those purchasing all their energy. Includes municipalities.



Capital expenditures increase appreciably

Utility Budgets Increase

Despite Financial Stringency Capital Expenditures for 1935 Are Increased 15 per Cent — Maintenance Expenditures Up 10 per Cent — Federal Funds Add $203,000,000 to Make 1935 Total $404,000,000

WHEN load grows as at present and deferred maintenance accumulates it is necessary to spend money. This situation faces the utilities, and budget estimates for 1935 are increased on both items. A capital budget of $201,000,000 in 1935, compared to expenditures of $170,000,000 in 1934, is paralleled with a maintenance expenditure of $84,463,883 in 1934 and a budget of $93,550,169 in 1935. To these must be added the enormous sums spent by federal agencies. These are estimated as $100,000,000 in 1934 and $203,000,000 in 1935.

Necessity is forcing utility expenditures and the budgeted values may be far below the requirements if loads come back and sales efforts bring expected results. The abnormal low loads of the past two years, the use of every possible expedient to save money, the bare shelves and storerooms, the deferred maintenance—all these have changed with the present revival of business and the lapse of time.

Returns from a large number of utilities indicate individual cases where expenditures are increased very largely because of load demands. Present load values are approaching all-time peak magnitudes in many instances and call for studies to build additional generating capacity. The great growth of domestic load and increased voltage and service standards call for revamping distribution systems. The enormous sums loaned or spent by the government with its present obligation of some $700,000,000 for power facilities, will provide for an added market and an added expansion in power facilities.

Total Capital Expenditures of Utilities

(Thousands of Dollars)

Year	Total	Generation	Transmission Distribution
1926.....	841,344	400,107	441,237
1927.....	760,353	234,883	525,470
1928.....	786,978	284,874	453,796
1929.....	866,344	281,460	528,896
1930.....	960,889	325,296	569,655
1931.....	633,415	162,843	428,797
1932.....	260,000	46,000	199,000
1933.....	186,050	30,000	140,000
1934.....	170,000	20,000	140,000
1935.....	201,000	30,000	160,000

Additional federal expenditures for electric utilities:

1934—$100,000,000 1935—$203,000,000

Maintenance expenditures by utilities:

1934— $84,463,883 1935— $93,350,169

These budgets are a minimum. If business increases, as the best judges of present conditions expect, there will be a large increase in expenditures and a demand for immediate shipments that manufacturers will find it difficult to meet. Wise executives are planning now on additions and extensions that will require time to consummate and are also filling up stores to be ready for the demands.

Where will the utilities get the money? Some will find difficulty, others have a good credit position and can sell notes or bonds to investment groups quite readily. Still others will get a credit extension, and perhaps a General Motors type of financial corporation sponsored by manufacturers can be developed to aid the credit situation. One thing is certain and that is the money will be had when customers demand the service. Despite the increases in capital and maintenance budgets for 1935 the totals are very low in any industry of this magnitude and are possible only for a limited period during an overbuilt status. The slack is being taken out quickly by the business recovery and the necessity for utility spending will add to employment and business recovery.

$700,000,000 for Federal Power

Federal Funds Poured Out Freely to Develop Electric Power — No Co-ordination as to Agencies or Policies — Minor Effects Expected of Loans to Municipalities — Future Funds Enormous

THROUGH direct appropriations and loans the federal government is committed to an expenditure of $702,433,600 in connection with electric power developments. This is the sum to be spent in the immediate future and the ultimate expenditures fully to complete the projects started are estimated at nearly $2,000,000,000. Aside from the P.W.A. loans to municipalities, the broad generalization may be made that all this expenditure can be challenged as unnecessary and wasteful so far as it is based upon the economics of power supply or the available power market.

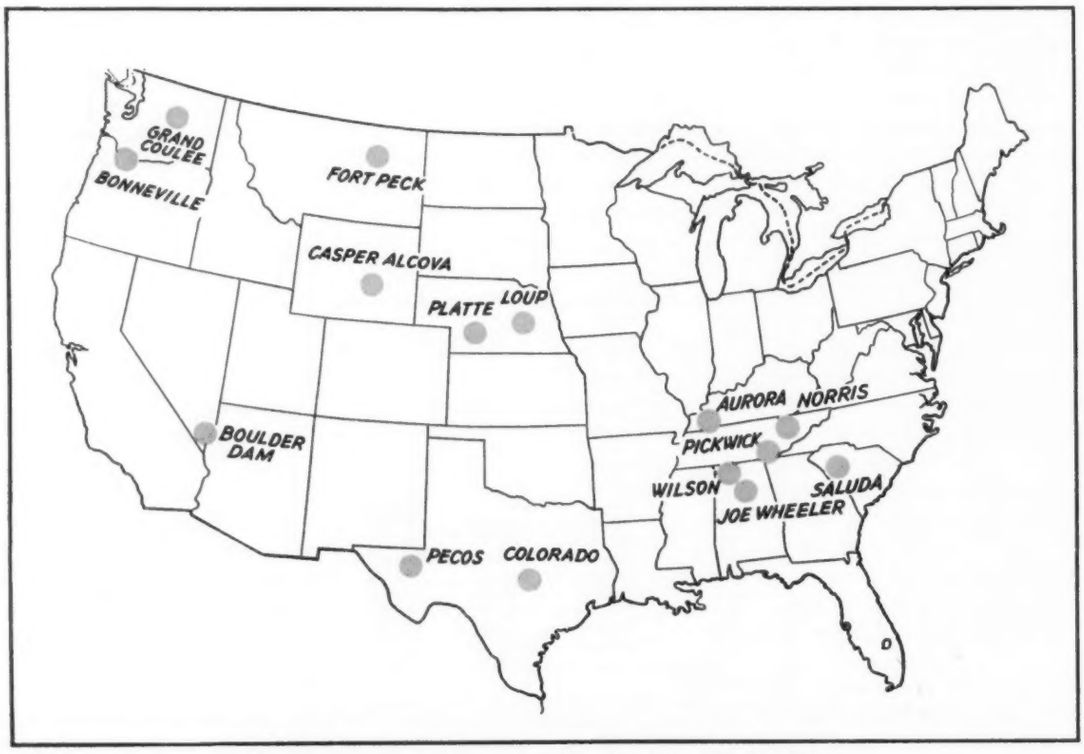
This money is being spent by three major divisions of government. T.V.A. is spending $311,000,000 on the combined power and social project in Tennessee and reports only to Congress and the President. The Department of the Interior is spending $226,767,000 in federal and state projects. The War Department is spending $139,000,000 on federal projects. P.W.A. is spending $25,666,000 through loans to municipalities, $2,637,500 to 49 existing municipal plants and $23,029,100 to 35 municipalities for the purchase or erection of new municipal plants in competition with existing private utility service. New York City is the latest to appear in the list.

Federal Obligations Total $702,433,600

T.V.A.	$311,000,000
War Department	139,000,000
Interior Department	226,767,000
P.W.A. to municipals	25,666,000

On the federal projects there is no co-ordination or similarity of plan and action. Boulder Dam, with an expenditure of $109,000,000, was authorized on the basis of signed contracts to use the power at prices that would amortize the investment. Up on the Columbia River the two dams were started as relief projects, with no plan for the disposal of the power and with the War Department in charge of Bonneville and the Interior Department in charge of Grand Coulee. The other federal and state projects are also vague as to the plans for use of the power and amortization of the investment. Work has started on some of them, but others are still in the planning stage.

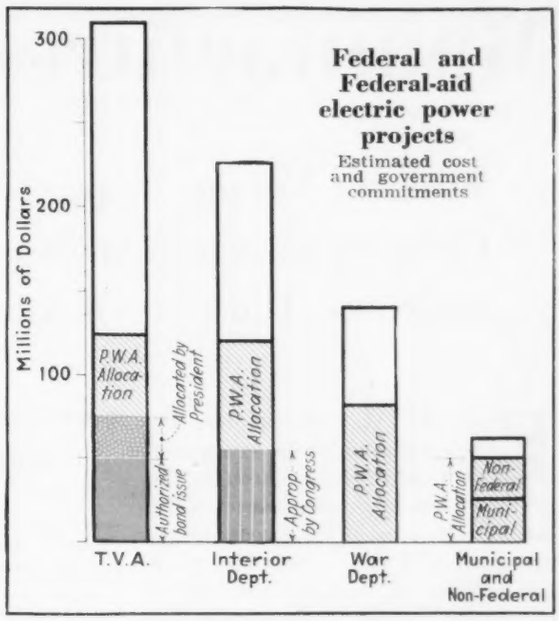
It is difficult to check the status of P.W.A. grants to municipalities. These loans are based upon a return of 70 per cent to the government and, in



Government projects dot the South and the West

the initial stages of the plan, many municipalities rushed to apply for money without having very definite plans for its expenditure. Existing municipal plants to the number of 49 borrowed a total of $2,637,500, only, showing how small the legitimate demand for expansion was despite the favorable loan conditions. Municipalities already served by private utilities also asked for loans. There were 35 of these and the total loans granted were $23,029,100.

Some of these loans were for street lighting only, others were used as threats or held up until bonds were voted and still others were held up by court cases brought by the competing private systems. Recent rulings of Secretary Ickes brought a cessation of this type of grant.



The situation today is that the government is committed to very large expenditures on federal projects, with more to come if these projects reach their ultimate development. Until they are developed and in operation no balance sheet can be taken to ascertain costs and returns, but in all the major projects a great excess of capacity is being made without regard to the ability of the markets to absorb the power. In several instances these projects were started purely as relief measures and without any plan for the disposal of the power. It will require a few years to see how the government will make out as a power salesman and for the taxpayers to appreciate their contributions to excess power production.

War Department Obligations Total $139,000,000

Fort Peck—50,000 kw.	$84,000,000
Allocated by P.W.A.	50,000,000
Bonneville—86,000 kw.	$55,000,000
Allocated by P.W.A.	32,200,000

T.V.A. Obligations Total $311,000,000

Wilson Dam	$25,000,000
Norris Dam	34,000,000
Wheeler Dam	38,000,000
Aurora Dam	42,000,000
Pickwick Dam	39,000,000
Hiwasee Dam	13,000,000
French Broad Dam	20,000,000
Transmission, etc.	100,000,000
	$311,000,000
Funds:	
Allocated by P.W.A. in 1933	$50,000,000
Allocated by President in 1934	25,000,000
Authorized to issue bonds	50,000,000
Immediate development about 425,000 kw. in seven dams at cost of about	$350,000,000
Ultimate development 1,500,000 kw. in 149 plants at cost of about	$1,000,000,000

Interior Department Obligations Total $226,767,000

Federal Projects—3—Total	**$194,700,000**
Boulder Dam—1,060,000 kw.	$109,000,000
Appropriated by Congress.	56,000,000
Allocated by P.W.A.	38,000,000
Operation begins in 1935	
Grand Coulee—504,000 kw.	$63,000,000
Allocated by P.W.A.	15,000,000
Operation begins in 1938.	
Caspar-Alcova—30,000 kw.	$22,700,000
Allocated by P.W.A.	12,000,000
Non-Federal Projects—5—Total	**$32,167,000**
Platte Valley District	$7,500,000
Allocated by P.W.A.	7,500,000
Firm power 85,000,000 kw.-hr.	
Sec. power 12,000,000 kw.-hr.	
Loup River District	$7,300,000
Allocated by P.W.A.	7,300,000
Firm power 144,000,000 kw.-hr.	
Sec. power 62,000,000 kw.-hr.	
Saluda River	$2,767,000
Allocated by P.W.A.	2,767,000
Firm power 29,000,000 kw.-hr.	
Sec. power 20,000,000 kw.-hr.	
Pecos River, Red Bluff	$2,600,000
Allocated by P.W.A.	2,600,000
Firm power 5,427,000 kw.-hr.	
Sec. power 4,575,000 kw.-hr.	
Colorado River, Tex	$10,000,000
Allocated by P.W.A.	4,500,000
Firm power 65,000,000 kw.-hr.	

P.W.A. Grants to Municipalities Total $25,666,600

Municipal Plant Extensions—49—Total, $2,637,0000

Alexandria, La.	$250,000	Fairview, Utah	$11,000	Minden, Neb.	$8,000
Alexandria, Minn.	26,500	Fayette, N. C.	35,000	Monroe City, Mo.	17,000
Anaheim, Calif.	15,000	Fort Morgan, Col.	23,500	Naperville, Ill.	85,000
Augusta, Kan.	6,000	Fort Pierce, Fla.	36,000	Okeene, Okla.	48,000
Austin, Minn.	46,000	Hannibal, Mo.	81,000	Osceola, Ark.	52,000
Belmont, Mass.	16,100	Hartford, Wis.	12,000	Pawnee, Ark.	60,000
Blackwell, Okla.	300	Hastings, Neb.	48,600	Rockville, Center, N. Y.	260,000
Blue Earth, Minn.	20,500	Herington, Kan.	3,500	Shelby, Ohio	160,000
Brooklyn, Ind.	12,000	Highland, Ill.	25,000	Springfield, Ill.	160,000
Buhl, Minn.	34,000	Hiram, Ohio	32,500	Stoughton, Wis.	39,000
Burlington, Vt.	74,000	Independence, Mo.	52,500	Tipton, Ind.	170,000
Cave-in-Rock, Ill.	23,000	Lawler, Iowa	1,400	Wapakoneta, Ohio.	146,000
Chambersburg, Pa.	26,100	Litchfield, Minn.	18,000	Waterloo, Ala.	8,100
Chanute, Kan.	29,500	Loyal, Okla.	7,100	Wellsville, N. Y.	85,000
Chicago Sanitary	230,000	Ludlow, Vt.	1,300	Worthington, Kan.	29,000
Columbia City, Ind.	29,000	McPherson, Kan.	58,000		
Danville, Va.	18,000	Memphis, Mo.	8,500		

Competing New Municipal Plants—35—Total, $23,029,100

Allegan, Mich.	$410,000	Decatur, Ala	$350,000	Morenci, Mich.	$146,000
Anthony, Kan.	15,000	Florence, Ala.	436,000	No. Chicago, Ill.	382,000
Augusta, Ga.	1,250,000	Fort Collins, Colo.	738,000	Salina, Kan.	6,000
Auburn, N. Y.	319,000	Hominy, Okla.	150,000	Seward, Alaska.	118,000
Austin, Tex.	4,500,000	Independence, Iowa	18,400	St. Cloud, Minn.	1,229,000
Burlington, Kan.	145,000	Iowa City, Iowa.	917,000	Sheffield, Ala.	230,000
California, Mo.	145,000	Kennett, Mo.	150,000	Sibley, Iowa	26,000
Camden, N. J.	6,000,000	Knoxville, Tenn.	2,600,000	Terre Haute, Ind.	20,000
Centralia, Ill.	477,000	Laclede, Mo.	14,000	Trenton, Mo.	315,000
Concordia, Mo.	47,000	La Plata, Mo.	100,000	Tuscambia, Ala.	130,000
Culpeper, Va.	160,000	Menominee, Mich.	803,000	Wheaton, Minn.	5,700
Cushing, Okla.	350,000	Middlesboro, Ky.	328,000		

Manufacturers Are Optimistic

Business Volume Expected to Increase About 17 per cent—Code Operations Stabilize Industry and Create Uniformity in Policies—Price Levels Adequate, but Business Volume Still Low

ELECTRICAL manufacturers are happy and optimistic as a whole. They have gone through the depths of the depression, mastered the essential features of their code operations, adjusted their operations to a low volume of business and expect fair profits from an expected increase in business this year.

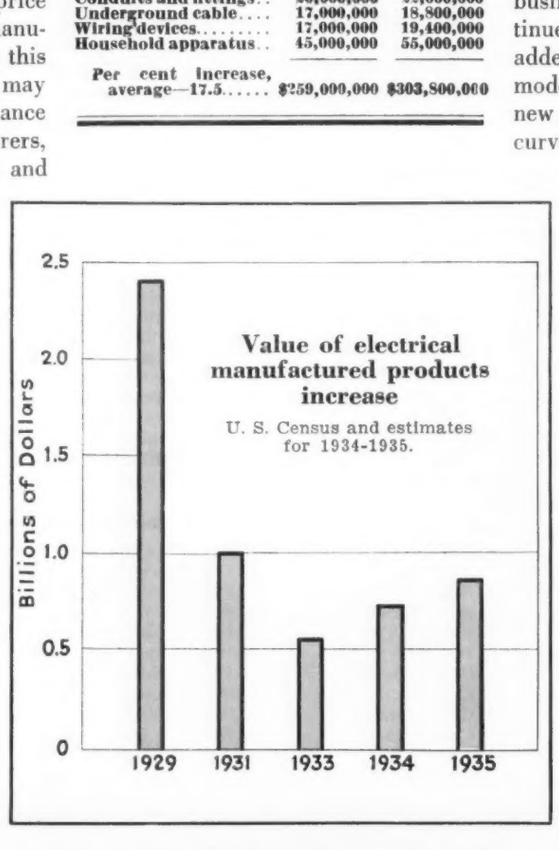
The Census figures tell the story. In 1929 the value of products was $2,300,000,000; in 1931 this had dropped to $995,010,213, and in 1933 to $549,983,599. The corresponding value for 1934 we estimate to be $700,000,000, and from budgeted returns from individual manufacturers and a study of business gages the 1935 estimate is $830,000,000. This is still a low value considering the productive capacity of manufacturing plants, but expense adjustments and present price levels make it possible for most manufacturers to make some profit on this volume of business. This effect may be noted from a study of the balance sheets of representative manufacturers, as shown in the tables on this and the following page.

Nor should it be forgotten that 1935 estimates are conservative and promise to be exceeded. If the industry puts on an aggressive commercial drive, if present loads continue to increase and if the national business situation continues to be as favorable as at present there is little reason to doubt that the business volume of 1935 will exceed the estimates.

Under their code the manufacturers have made an outstanding success in co-operative work. All are favorably disposed to the essential principles of their code and admit its effective aid in bringing harmony and unity into electrical manufacturing, in stabilizing competition by forcing minimum wages and hours and in developing a better conduct of business through the educational values, the interchanges of opinion, the compilation of statistics, and the use of cost accounting. Code operation is not perfect nor satisfactory in many details, but on the whole the code experience has been valuable and constructive.

Estimates of Sales in 1934 and 1935

Class of Product	1934	1935
A. C. generators including generator end of prime movers	$16,000,000	$20,800,000
Synchronous condensers and frequency changers	1,500,000	1,950,000
Motor-generator sets	4,000,000	5,000,000
Distribution transformers 1½ to 500 kva.	11,000,000	14,000,000
Power transformers	7,500,000	8,250,000
Induction motors—1 hp. and over	33,000,000	36,300,000
Fractional-hp. motors	26,000,000	30,000,000
Synchronous motors	4,000,000	4,600,000
Switchboards and accessories	9,000,000	10,000,000
Metal-inclosed switchgear	2,200,000	3,000,000
Circuit breakers, oil and air	6,500,000	7,800,000
Meters, all types	9,500,000	10,600,000
Arresters	3,200,000	3,800,000
Induction regulators	1,000,000	1,300,000
Furnaces, industrial	2,500,000	3,000,000
Heating devices, industrial	3,500,000	4,800,000
Control, industrial	12,000,000	14,400,000
Welding app. and supplies	8,000,000	8,800,000
Conduits and fittings	20,000,000	22,000,000
Underground cable	17,000,000	18,800,000
Wiring devices	17,000,000	19,400,000
Household apparatus	45,000,000	55,000,000
Per cent increase, average—17.5	$259,000,000	$303,800,000



Value of electrical manufactured products increase

U. S. Census and estimates for 1934-1935.

Aside from the government projects no great extension of transmission has occurred or is contemplated. However, many short lines and the rebuilding of existing lines may be expected to care for load, to improve service and to rehabilitate systems. Wood-pole secondary type lines especially are expected to be built in considerable volume.

Undoubtedly the greatest market in utility equipment will be in substation, switching and distribution fields. Rebuilding of distribution will occur in volume to care for intensified loads and to improve voltage and service. High-speed switching is essential to good operation and new

Sales Billed Increase Largely

	1932	1933	Three Quarters 1934
General Electric	147,162,291	136,637,268	121,735,122
Westinghouse	77,073,586	68,188,353	69,245,486
Allis-Chalmers	14,764,064	13,286,768	14,301,206
Cutler-Hammer, Inc.	3,001,897	3,655,657	3,814,906

breakers will be sold and old breakers remodeled. Substation and transformer equipment are necessary to care for increased loadings. A particularly active market will be in overhead distribution to homes, and some of this work, especially services, will necessitate the use of cables. Underground systems will be strengthened and extended in many instances and the rural and street-lighting markets are expected to be more active.

An intensified drive for home electrification promises to open a wide market for appliances, lighting and wiring devices. Manufacturers have brought out new lines of appliances priced to meet all ranges of service and the public acceptance of home electrification combines with plans for domestic sales to promise a large volume of business this year.

New markets and new equipment

An added growth in electrical manufacturing comes from the development of other applications than industrial power or utility service. Renewed interest in railroad electrification exists and both trunk lines and self-contained locomotives are expected to afford an even larger business next year. Nor should it be forgotten that air conditioning is now almost a necessary part of all transportation.

In the realm of electric heating and welding a very fine business has grown and bids fair to grow even more rapidly. Welded fabrication is getting to be almost universal for all equipment and apparatus construction. More specific specifications for materials and alloys are augmenting the business in melting and heat treating furnaces. The sales campaigns to get industry to use small heating devices have brought good results and have opened the market to a wider acceptance of electric heat.

And there seems to be no end in new electrical applications. The vacuum tube is finding new applications to power and industry each month. Therapeutic instruments are all going electrical. New chemical and electrochemical processes depend upon electrical equipment and methods. Lighting is just coming into its own and some day streets, highways and rooms will really be properly lighted.

Price levels in most lines are fair considering the volume of business, and if business volume increases rapidly it is expected that the price trend will be down and not up, despite increased wages, taxes and costs for materials. On the whole, the electrical industry expects a profitable year.

Electrical Machinery, Apparatus and Supplies by Class and Value

(United States Census)

	1933	1931	1929
Number of establishments	1,208	1,379	1,802
Wage earners	130,862	180,106	328,722
Wages	$115,824,053	$204,488,041	$456,377,629
Cost of materials, fuel, energy	212,560,214	337,124,534	971,017,623
Total value of products	549,983,599	995,010,213	2,300,915,572
Value added by manufacture	337,423,385	657,885,679	1,329,897,949
Generators, motor-generator sets	16,298,418	34,437,877	80,932,360
Transformers, regulators, reactors	12,565,235	42,742,258	84,032,353
Control apparatus	14,858,136	22,186,031	44,288,544
Motors, automotive starters	55,703,075	95,002,893	194,845,523
Electric fans	2,437,347	8,984,016	10,196,353
Batteries and parts	63,705,427	85,936,160	149,934,676
Lamps and X-ray tubes	42,274,078	70,502,054	85,319,515
Industrial and commercial apparatus	10,672,485	17,660,020	28,636,977
Household apparatus and appliances	35,728,375	55,578,467	84,485,468
Instruments, relays, inst. transf.	8,871,765	22,714,914	.....
Switchboard circuit breakers, switches	14,498,734	44,832,249	81,201,122
Insulated wire and cable	61,226,485	120,197,302	312,592,093
Wiring devices	16,464,997	21,778,359	38,395,283
Conduits and fittings	18,323,117	33,426,801	58,157,565
Fuses and fuse blocks	4,825,478	7,761,248	14,036,325
Miscellaneous	116,731,614	294,738,108	530,973,804

Unit Values in Electrical Manufacturing

(United States Census)

	1933	1931	1929
Value of products per wage earner, dollars	4,230	5,500	7,000
Wages paid per employee, dollars	885	1,130	1,390
Wages per dollar of product, cents	20.9	20.4	20.2
Material, fuel, energy per dollar of product, cents	38.5	54.2	42.2

Net Income of Representative Electrical Manufacturers

	1933	1932
Acme Wire Company	6,915	*167,982
Air-way Electric Appliance	*84,019	*397,935
Altorfer Bros.	272,415	*171,710
Allis-Chalmers Mfg.	*2,893,905	*2,955,043
American Transformer Co.	*93,443	*69,759
Anaconda Wire & Cable	*213,872	*1,045,110
Apex Elec. Mfg.	210,759	*67,198
Belden Mfg.	210,520	*231,044
Benjamin Elec. Mfg.	*282,162	*289,189
Birtman Elec.	106,124	*5,987
Black & Decker Mfg.	*683,610	*798,312
Chicago Elec. Mfg.	21,534	*9,714
Century Electric Co.	*91,405	264,757
Claude Neon Elec. Prod.	324,823	400,659
Crocker-Wheeler Elec. Mfg.	*123,531	*429,279
Cutler-Hammer, Inc.	*130,386	*736,458
Driver-Harris	132,581	*378,671
Easy Washing Machine	312,670	*144,619
Edison, Thos. A., Inc.	526,000	*602,000
Electric Controller & Mfg.	*79,151	*369,890
Electric Auto-Lite	684,372	1,364,059
Elwell-Parker Elect.	*19,707	*117,124
Electric Household Util.	420,791	*270,034
Electric Storage Battery	2,022,206	1,259,859
Eureka Vacuum Cleaner	99,035	48,110
Fairbanks Morse Co.	*1,147,340	*2,114,491
Federal Electric Co.	*46,254	*207,701
Formica Insulation	7,333	*56,138
General Electric	13,429,739	14,404,110
Grigsby-Grunow Co.	*2,215,530	*2,775,569
Hoskins Mfg.	125,615	56,774
Hygrade Sylvania	655,073	851,527
Kelvinator Corp.	723,561	102,701
Landers, Frary & Clark	236,409	75,916
Line Material Co.	*43,430	*216,250
Manning Bowman	*24,271	*125,242
Maytag Co.	1,204,503	100,773
McGraw Electric	105,550	*269,124
Moloney Electric Co.	136,718	39,044
Ohio Brass Co.	54,261	*878,828
Otis Elevator Co.	*2,465,028	307,519
Sangamo Electric	*63,655	*263,931
Servel, Inc.	*493,399	*777,443
Wagner Elect. Corp.	*66,349	*181,158
Westinghouse Elec. & Mfg.	*8,636,841	*8,903,540
Weston Elec. Inst.	*24,369	*143,354

*Deficit.

Resuming Construction

468,700 Kw. to Be Added in 1935 Exclusive of Federal Work

WITH nearly half a million kilowatts of new generating equipment in process of installation in public utility plants and definitely scheduled to go into operation during the year, additions in 1935 will greatly surpass those of the past two years. The 468,700 kw. in the accompanying summary is the minimum figure; it leaves out of account, for example, the 275,000 kw. in the State Line plant, for which the date has not been positively set; it omits the units at Boulder Dam, which will probably start operating, ahead of schedule, before the end of the year, and it excludes the new Canal Zone plant.

These may raise the total by several hundred thousand kilowatts, and of course if all the federal projects, now in progress and due to begin operations within the next few years, are counted in the aggregate runs into imposing millions. Data on the prospective ultimate rating of these projects are still tentative and the figures announced at different times and by different agencies vary. It would be idle at this stage to attempt an accurate summation.

Prominent in the program for 1935 is the 165,000 kw. addition in Richmond station of the Philadelphia Electric Company, the 80,000 kw. in the new Port Washington station of the Milwaukee Electric Railway & Light Company and the 135,000 kw. at Diablo of the Seattle municipal system. Detroit Edison has a 30,000-kw. unit scheduled to go into operation at Connors Creek in August, partly balanced by taking a 20,000-kw. unit out of commission in March, all as part of an extensive program of rebuilding and rearranging that has been in progress for several years. Among municipals the largest addition in steam will be the 10,000 kw. in Springfield, Ill.

The survey discloses only a few installations driven by internal combustion engines, although an effort was made to discover all those of 500 kw. or larger. No doubt the list could have been extended by including those of lower rating.

Capacity decreased in 1934

During the years of most active growth additions far exceeded retirements; new installations were 2,500,000 kw. or more annually, net growth was around 2,000,000 kw. Completion of contracts previously started, coupled with the necessity of anticipating future demands long in advance of their arrival, kept construction going for several years after the events of 1929. As recently as 1933 new equipment was listed to the amount of 346,350 kw. But the load had failed to build up; there was little need of additional generators; 1934 brought in only 94,705 kw.

Against this increase a survey of

[*Continued on page* 85]

Summary of Additions

	1934 Private	Municipal	Total
Steam	3,000	44,000	47,000
Internal comb.	605	5,200	5,805
Water Power	29,100	12,800	41,900
Total	32,705	62,000	94,705
Definitely Scheduled for 1935			
Steam	269,000	33,000	302,000
Internal comb.	700	3,250	3,950
Water power	27,000	135,800	162,800
Total	296,700	172,050	468,750

Capacity Scheduled for Completion in 1935

Public Utilities

Steam Company	Added Kw.	New Kw.
Chicago Dist. El. Gen. Corp.	(*b*) 275,000	.....
Detroit Edison	(*c*) 10,000	.....
Iowa El. Lt. & Pwr.	6,500	.....
Milwaukee E. R. & L., Pt. Washington	.....	80,000
Philadelphia El., Richmond	165,000	.....
Virginia Pub. Service	7,500	.....
Internal Combustion		
Northwestern (Iowa) Lt. & Pwr.	700	.....
Water Power		
Kanawha Valley Power	.....	27,000
Pacific Gas & Elec.	.....	(*b*) 1,500

Municipal Plants

Steam		
Alexandria, Minn.	1,500	.....
Chambersburg, Pa.	2,000	.....
Hannibal, Mo.	7,500	.....
Highland, Ill.	1,500	.....
Independence, Mo.	3,000	.....
Manitowoc, Wisc.	5,000	.....
Springfield, Ill.	10,000	.....
Troy, Ohio	2,500	.....
Internal Combustion		
Bryan, Ohio	1,000	.....
Imperial Valley Irr. Dist.	.....	2,250
Water Power		
Norwich, Conn.	.....	800
Seattle, Wash. (Diablo)	.....	135,000
U. S. Gov't., Madden Dam, Panama, Canal Zone	.....	16,000

(*b*) 1935 or later. (*c*) Net of addition of 30,000 kw. less 20,000 kw. out of commission.

Power Plant Capacity Added During 1934

Public Utilities

Steam Company	Added to Existing Plants, Kw.	New Plants Kw.
Abington Electric, Pa.	3,000	....
Internal Combustion		
Central Power & Light, Texas	40	....
El Paso Electric, Texas	150	....
Provincetown Lt. & Pwr., Mass.	415	....
Water Power		
Bangor Hydro-Elec., Me.	(*a*) 700	....
Pub. Serv. of New Hampshire	(*a*) 400	....
Safe Harbor Water Power, Pa.	28,000	....

(*a*) Partial replacement or rehabilitation.

Municipal Plants

Steam City	Added Kw.	New Kw.
Anthony, Kansas	750	....
Austin, Minn.	3,500	....
Austin, Texas	7,500	....
Blue Earth, Minn.	500	....
Carlyle, Ill.	500	....
Chicago, Ill.	1,500	....
Columbia City, Ind.	1,000	....
Holyoke, Mass.	5,000	....
Richmond, Ind.	15,000	....
St. Bernard, Ohio	1,250	....
Taunton, Mass.	7,500	....
Internal Combustion		
Culpeper, Va.	.....	700
Litchfield, Minn.	750	....
Neodesha, Kansas	600	....
Oberlin, Ohio	.....	1,600
Russell, Kansas	700	....
Sioux Falls, S. Dak.	850	....
Water Power		
Chicago Sanitary Drainage Dist.	12,000	....
Radford, Va.	.....	800

Developments of the Year

A Report by the Editors — Their Analyses and Suggestions

FACTUAL REPORTS are most valuable if interpreted and analyzed. In the following article the editors have made a condensed survey of accomplishments and trends in the electrical industry and from these studies have drawn certain conclusions and made some suggestions for industry action. In these studies they have had the hearty co-operation of competent men in the industry who are active in the several fields, in addition to personal contacts with committees, utility properties and manufacturers. It is believed that these reports represent a most authentic and pertinent survey and analysis. They are intended to be specific, to be constructive and to point the way for industry progress. All may not agree with the statements and conclusions and other points of view will be welcomed for publication.

The editors believe that the decrease in industry committee activity and in committee reports for the benefit of the industry is unfortunate and should not be continued. This year these reports are meant to fill this gap and also to indicate work that should be done by committees of the industry continuously if best results are to be had under present conditions. There are many new problems, there is a changed personnel, there are many opportunities for development of new and better methods and equipment. Industry specialized men should get together and work upon a co-operative basis toward these common objectives. Industry executives appreciate the value of this kind of work and the false economy that prevents it being done and have already co-operated in developing new industry committees. In the meantime these surveys are contributed by the editors for the benefit of the industry.

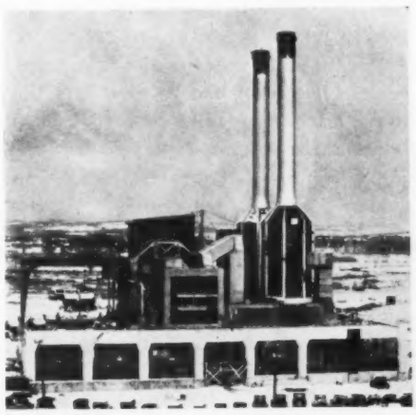
Generation Makes Progress

Government projects stimulate hydro developments — Unit steam stations favored with use of high pressure and high temperatures — Diesel units develop rapidly — Detail improvements notable

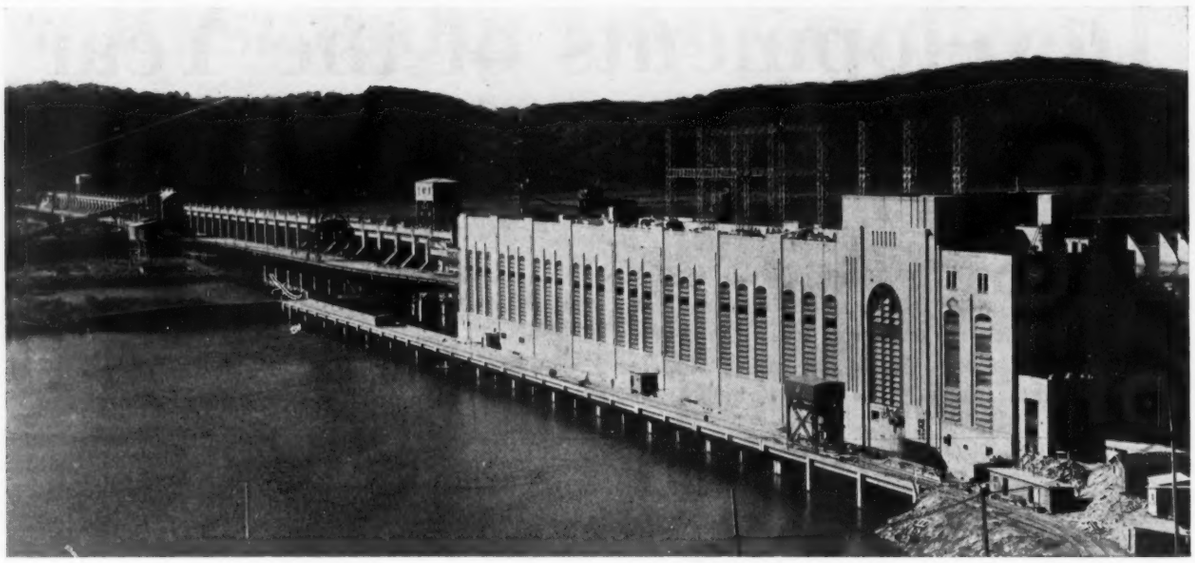
ADDED generating capacity is in the offing. Unfortunately many utility executives and federal authorities have the false conception that the economics of power supply favors the use of very large stations and long transmission lines. This uneconomic conception has already been applied too extensively by utilities and now the federal government is planning an immediate expenditure of $700,000,000 based upon this premise and a further misconception of the economics of fuel and water power.

Power developments, during the year, cost data and technological progress all indicate that added generating capacity should be based upon generating power in comparatively small stations at the loads and load centers, the greater use of fuel stations and the use of transmission chiefly as diversity and emergency tie lines. The economic distance for electric power transmission has decreased steadily in recent years and is now in the order of 60 miles instead of the hundreds of miles so often publicized. Increased service standards for voltage and continuity still further limit the development of the so-called "grid" system for national power supply.

Added generating capacity in large measure can be had best and most economically by first trying to modernize existing fuel-burning stations by the rehabilitation of boilers, fuel-burning equipment and turbines or by using superimposed high-pressure, high-temperature units. After this has been done the next logical step is to add new unit fuel-burning stations at load centers in a geographical area as contrasted to building a single large bulk power station. In this type of study it will pay to examine the full possibility of the use of joint utility-industrial stations for power and steam, the economics of Diesel stations and the economics of stations as determined by size or rating of units.



Another aspect in the power situation is possible improvement and economy in the methods used in purchase and negotiation and in the commercial organization for selling power stations. Much of the equipment for a modern boiler and turbo-generator is so standard for a given set of conditions that negotiations on engineering details, on many alternative but minor changes in assembly and for special or non-standard equipment increase costs far beyond any gains made in station performance or economy. Also, it is as yet impossible to buy an assembled unit power-generating station with all equipment fitted together as though designed and built by one manufacturer. It is a job assembly with either



The government is heavily committed to multiplying hydro sources

the purchaser or the manufacturers negotiating for the items to go into the assembly and without full capitalization of the unit idea to save first cost and improve operating performance.

The full possibilities in a factory-built unit-assembly power station will come, and when they do probably greater cost reductions will be made than in any improvements possible in thermal efficiency in the near future. The assembled equipment in a power station should be as standardized and compact as a Diesel or gas engine station for a great many installations. The purchaser could then buy a power station at minimum cost and a manufacturer or a group of co-operating manufacturers could sell one complete and stand back of performance guarantees. This commercial situation is a large part of the present economics of power supply and deserves serious consideration.

Some technical developments

In the fuel-burning station the trend continues toward high pressure and high temperature, elimination of reheat, the maximum use of the unit design principle and the use of high-rate, large-capacity boilers and turbines to reduce costs. For many additions of capacity the economic procedure will be to rehabilitate an existing station by the use of modern boiler and firing equipment and possibly a high-pressure turbo-generator. Where favorable conditions exist the stations can be modernized and increased in capacity for from $25 to $40 a kilowatt. In other instances the use of a superimposed high-pressure installation is found economical. No extension of the three stations using the mercury-steam combination is contemplated at this time, although operating experience has been very satisfactory. Undoubtedly the near future will find a small unit steam plant available that will be advantageous for use in power generation and will compete in over-all economy with small internal combustion type stations.

In the boiler plant developments continue rapidly toward getting high ratings in a small volume. Stokers have been improved by the use of zone air control, researches to get better material and researches to get water cooling. The use of preheated air on existing designs is limited at present to about 400 deg. F. Pulverized fuel-burning equipment has also been improved, with the unit system favored. This type of firing predominates in the stations where high ratings are desired. A single burner can now produce 135,000 lb. of steam per hour and controls have been developed to give proper fuel supplies at low ratings.

Use of the water-cooled slag type boilers has been had to give data that show an enormous unit volume heat release and absorption. These furnaces are made with a unit design and inclosure for boiler, economizer, air heater, precipitator, etc., to reduce station space and flue losses. The fly-ash problem from pulverized fuel firing is solved by the use of precipitators in series and research continues to reduce the cost and improve the performance of these devices.

Development of alloy steels continues and a better understanding of their fitness for high-pressure, high-temperature operation is had, so that great progress is being made toward the use of a simple regenerative cycle, with consequent reduction in cost and improvement in performance. The one-boiler-per-turbine principle with unit auxiliaries and local controls makes possible great savings in first cost of stations, better operation and the economic rehabilitation of older stations. The use of 3,600-r.p.m. units offers cost-reduction possibilities, although present limits in capacity are about 35,000 kw., with 18,000 kw. as about the largest unit in use.

The extreme trend toward station thermal economy has been checked carefully against dollar economy and some refinements, accessories and "traps" have been found uneconomical. This has further tended toward simplicity and unity in station design. No great economy has been found in going to the outdoor station, but this field has not been fully explored as yet to balance a possible 2 or 3 per cent saving against operating disadvantages and the possibilities of reducing the cost of plant superstructures. It is also the general opinion that it is false economy to lay out a station based upon making future additions and extensions according to present designs. The art and practice shift too rapidly to warrant any great investment for the future in the light of present knowledge.

In Europe the Benson, Loeffler and other type of boilers are developing

steadily, but these are yet in the offing for present American practice, although one manufacturer has acquired the right to make Benson boilers in this country. Undoubtedly their development and the further use of the principle of generating in small units at the loads favor the use of these boilers in the near future. It is also evident that the sale of steam as well as power to industrial plants and the increase in the use of joint utility-industrial power plants favor the growth of new types of stations of the smaller unit type. It is also possible and probable that hydrogen or other cooling will be applied to turbo-generators in the near future and research continues to get higher voltage generator units for transmission applications.

Some interesting developments in steam turbo-generators occurred during the year. An economical trend is illustrated by the 110,000-kw. vertical-compound unit for the Ford Motor Co., where savings in space and in foundation costs are made by mounting the 1,200-lb. turbo-generator on top of the low-pressure unit with integral air coolers in the common generator housing. It is also notable that this unit is designed for 900 deg. F. initial temperature.

1,200 lb. 1,000 deg. feasible

Another large unit is the new 165,000-kw. tandem-compound unit for the Philadelphia Electric Company. This unit will operate at 375 lb. and 825 deg. F. on a 29-in. vacuum. Several turbo-generators for frequencies up to 180 cycles were built for the rayon industry using speeds up to 5,400 r.p.m. Also there is a continued development of 3,600-r.p.m. units here and abroad. At least one manufacturer has offered to build a 200,000-kw., 1,200-lb., 1,000-deg. F. tandem type turbo-generator.

In addition to these developments improvements have been made in blading, in materials used and in the elimination of fire hazards. One manufacturer uses a non-inflammable fluid for valve controls and all have rearranged oil piping to reduce fire hazards. The general trend is toward simplicity and unit construction with higher pressures and temperatures is favored. Condensers have been improved greatly. The hydraulic coupling drive for boiler fans has been improved and is favored for many applications.

In the realm of hydro stations marked progress has been made in pumping equipment and in improvements in waterwheel generators. Hydraulic researches on cavitation and water hammer have continued. Propeller type units have been improved. New record-breaking units rated at 82,500 kva. for 530-ft. head at 150 r.p.m. have been ordered for Boulder Dam and the T.V.A. units of 45,000 hp. for 48-ft. head at 85.7 r.p.m. The Kaplan type finds acceptance where there is a wide variation in flow conditions.

The Diesel engine has found increased favor in stationary plants and in transportation. Developments have occurred in increasing the speed, use of superchargers, in the use of better materials and design and in the use of mechanical fuel injection. Railroad use of Diesel-electrics for switching service and for stream-lined trains is on the increase. No definite reports are yet available over a long period on the performance of recently built large Diesel stations such as that built at Vernon.

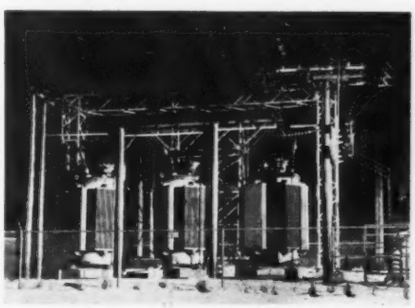
Distribution Holds Attention

Review of transmission, substation and distribution development — Lightning-proof lines, rapid reclosures and fast relaying — Unit substations — Economies in distribution systems — New practices

FOR many years major attention was devoted to the generation of electricity. Now the scene has changed. It is in the realm of getting electricity from the station to the user that executives, engineers and manufacturers are seeking to make major progress. Networks, lightning-proof lines, outdoor metering, voltage regulation, unit substations, the "cost of distribution"—all these are topics that have replaced the older discussion of large stations, large generators, fuel economy and boiler efficiency.

The reason is obvious. Present and future loads will exact the best possible standard of voltage and service continuity. The major part of the system investment and system operating cost is in this part of the system and the opportunities for cost reductions are greatest because too frequently this part of the system grew up on a piecemeal basis. There is an imperative demand for superior service at the lowest annual cost. There is a challenge to the industry to reduce the cost of distribution.

Events of the past year and present trends effectively squelch any attitude of complaisance about economy in these aspects of the utility system or contentment with present practices and equipment. There is money to be saved, there is rebuilding to be done, there is new equipment to be developed because the evidence of progress here and there is tangible and illuminating.



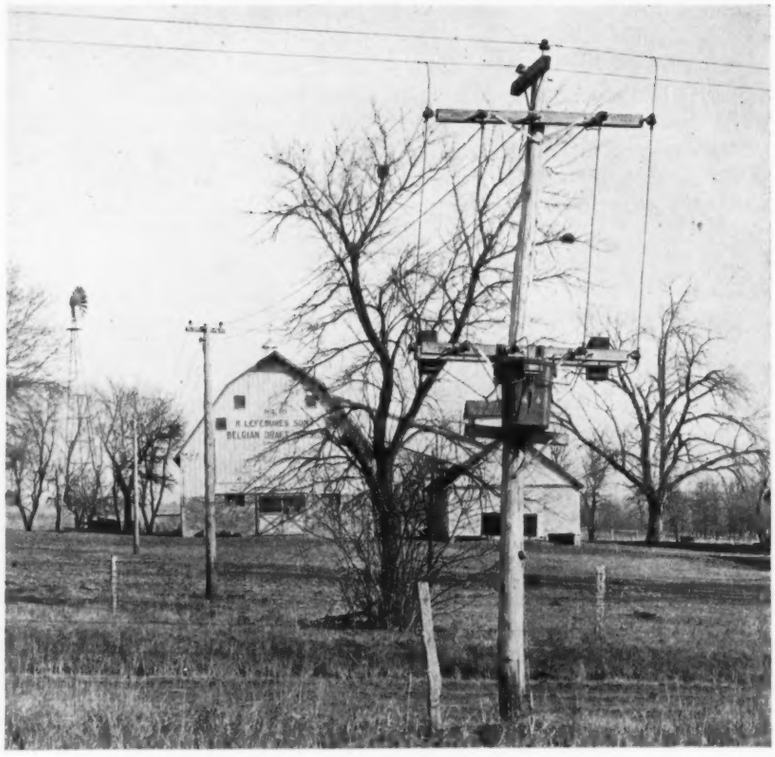
Lightning-proof transmission

New records in voltage and in magnitude were made in transmission this year. The Boulder Dam-Los Angeles line reaches the top in voltage, in magnitude of structure, in protective features and in loading. It marks the extreme use of a double counterpoise for lightning protection with a combined crowfoot and parallel configuration. Fairly definite bases were available to proportion counterpoise length to wave-front rise-time. For major trunk-line transmission the counterpoise is accepted practice and the decadence of the induced stroke theory has led to revamping ground wire protection to give greater separation from active conductors and better shielding against direct strokes. Engineers feel confident that the lightning-proof transmission line can be built where the load and the importance of the service justify the investment.

In the intermediate voltage realm wood-pole lines continue to gain in favor because of their relatively low first cost and relatively increased insulation values. Massachusetts has a new 115-kv. line with grounded horn-gaps to protect the trussed wood cross-arms. Carolina has a new single-circuit, 110-kv. H-frame line with ex-

pulsion tubes mounted on each structure near each insulator to chop flashes in ½ cycle. Its record has been splendid. The American Gas & Electric system has used these tubes on a steel tower line with good success. A combination of tube protection and fast breaker operation promises notable progress in transmission operation.

Better construction, better insulation and more knowledge of lightning on transmission have been accompanied by two very important developments. Faster relaying and faster breaker operation have done much to solve the system stability problem and to give continuous service through instantaneous reclosure. Oil breakers to operate at 8 cycles or less have been installed on many properties, old breakers have been remodeled for fast operation. A notable new development is the 3-cycle operation for the 287-kv. single-pole impulse type of breakers for Boulder Dam. These are rated 2,500,000 kva. Standard breaker ratings and operating performance cycles have been agreed upon that make for economy and uniformity.



Rural lines are the objective of cost reduction

Substations now functional

In the older days a transmission substation was an assembly of equipment on a large area without much co-ordination as to insulation values, protection or co-ordinated performance. The metropolitan substation was a similar assembly in large units in a rather expensive building.

All this has changed greatly. The substation is now viewed as a co-ordinated functional assembly made up on one or more capacity units. The ratings, the insulation and the performance of individual items are co-ordinated and in large measure the manufacturers have developed the factory-built and functional idea. For underground networks and for overhead systems a substation can be had from the factory that performs all functions and necessitates only a vault or concrete platform for mounting and the connection of incoming and outgoing leads. For intermediate voltages the metal-inclosed type of unit substation has been developed and used to a large extent. For high-voltage transmission the units are still assembled with space separation. This trend has meant reduced costs, better performance and greater standardization.

Protection at the substations is still in a state of development. In general, the trend is to shield transmission substations by extending shield wires out on the lines about a mile and draining lower value surges by protective devices or by use of self-protecting apparatus. Down in Georgia and in other localities a grounded gap is used as a protective device, in other cases a fused gap with a back-up grounded gap is used and still others use arresters or arresters and gaps, while a few depend upon bushing or insulator flashovers.

In the metropolitan substation the principle is followed to use more substations as contrasted to a few large ones so that increment additions to capacity are of less magnitude, flexibility in making capacity changes for load changes is had, less investment is required in substation structures and less labor is involved in substation installations.

The vault type of underground network substation has been improved largely with respect to better network switches and relays, the use of a non-inflammable dielectric for certain applications and the making of a simpler and more compact assembly.

Distribution receiving attention

There once prevailed the notion that electrical distribution was what it had to be and little could be done about it. A look at the year's record shows, however, that plenty can be done about it and is being done.

Several aspects are prominent. One is sightliness in overhead construction, another is the necessity to improve voltage and service continuity, another is to rebuild systems more economically and to develop a plan for extensions and still another is to develop new equipment and practices.

Out in Detroit engineers have gone after the pole-top structure to eliminate idle pin space, ineffective use of materials and enhance the appearance. Down in Memphis they are trying to reduce costs by using hard-drawn wire, long spans and messenger hangers. Especially important is the pole problem, for poles are one of the costly items in distribution. Several properties have used poles of lower class rating successfully by closely checking loadings. Many are finding that it is economy to buy good poles to start with. Serious attention is being given to pole maintenance, pole stubbing and pole replacements, although no agreement exists as to practice or as to the real economy involved.

After the poles come the lines. The use of bare wire where trees do not prevent is on the increase. The use of better weatherproof wire is notable and research continues at Purdue and other places to produce a still better cover-

ing. Manufacturers continue to develop new cables and hardware for use in distribution. The solderless connector with hard-drawn wire permits of longer spans and expediting connections at substations and transformers.

In underground cables greatest development has been had in improving the lead sheathing by use of special precautions in manufacture such as extrusion in vacuum or hydrogen or carbon dioxide atmosphere. Nonmetallic sheathed cables have been made for network service.

Transformer developments have also been rapid. Studies on several systems of the proper transformer and wire sizes to use have made economies. Transformer manufacturers have made many new developments to get better insulation, lower impedances, more self-protection and a greater simplicity in the assembly of transformer and accessories. Cutouts and fuses have been improved and breakers are available for use in or outside the transformer case. Live line taps are being used in some places to connect in transformers for higher voltage lines. A very general practice is to interconnect primary and secondary neutrals where a good and permanent ground is available. The arrester ground is also interconnected and a more general use of improved arresters is had with distribution transformers. Self-protecting types of transformers are available with arresters inside or outside the case, interchangeable arrester bushings, interior gap and tube protection and bushing flashover values adjusted to insulation of coils. Lower impedance in transformers has improved voltage conditions.

In some cases transformers through manual or automatic tap changers combine the regulatory with the transformation function.

Regulation active

When domestic customers use heating devices, oil burners, ranges and refrigerators they must have good voltage and continuous service. Voltage regulation is best done by doing the utmost with the system layout, but even so supplementary regulation is necessary. Regulator devices of several types are now available for use at any point from generating station to the ultimate customer. Decision as to what to use and where to use it is made for each case. Step regulators are used to take care of long feeder drops, induction regulators are relied upon at stations and substations, auto-transformers have proved effective in taking care of flicker. New Jersey found a series capacitor wholly feasible as an automatic regulator in a special situation. Pole-mounted regulators find a place. Departures in regulators of the Ferranti and Amertran types have been developed and Roller-Smith has applied the vacuum tube to a new regulator. Tap-changing and induction regulators have been improved greatly and are being sold in larger volume.

Moves toward continuity

Service continuity has also gained from the development of new devices and the improvement of old devices. An air-break sectionalizer for cabled ring primaries was announced. A scheme for transferring faulted feeders to a single multi-service breaker has been proposed. Faster reclosure of breakers is accepted as advantageous. Florida Power developed two methods of speeding up reclosure of feeder breakers by use of fast relays. Reclosing and repeating fuses of several types are available. Georgia Power has a ground relaying scheme to improve rural service. An oil-inclosed reclosing device for pole mounting is available. These accessories and the improvement in construction and equipment have improved service greatly. But when a completely electrified home is served, unquestionably still better devices and higher standards of construction will be required and the cost of distribution is likely to increase instead of decrease to meet these new standards.

In services themselves the year found the quantity introduction and adoption as standard of interchangeable meter mountings. A new demand meter was announced. New service entrance cables were introduced. Interior wiring is still in process of change and development. A great many properties are changing all services and switches to carry heavier loadings. An increased demand and necessity exist for underground services.

If one guesses rightly, the whole activity in the field of getting electric service to the user has been devoted to improving the service and watching for every opportunity to save a dollar at the same time. Confident operators will trust management to see that compromising with service quality will never be a legitimate excuse for paring rates. Shrewd operators will insist upon support for the program which they have manifestly started to bring distribution up to the levels of performance already attained by generation and transmission.

Power-Sales Results and Trends

Achievements in some industrial territories — Where the new business is coming from — How utilities have reorganized for developing usage — Immediate markets available — Approach to untouched fields

RESULTS achieved by thirteen operating companies in industrial districts of the East, Middle West and South are presented in the accompanying table to show the extent of acquisition of industrial business during the past year and also the industries and applications which figure most prominently. Changes which are expected by them during 1935 and where they will concentrate sales effort are also indicated.

A number of utilities have prepared themselves better than ever before to go out and sell increased industrial usage of purchased power. Changes include reorganizations and increase of sales staffs; better bases for paying salesmen; more comprehensive analyses of markets based on better methods of locating processes where electricity can be applied with benefits; provision for comparing cost of securing different classes of business with the obtainable revenue; co-ordinating the collection of sales ammunition for salesmen; more appropriate starting-current rules, and modifications of rate structures.

The immediate market

Immediate opportunities for increasing industrial revenue are in stimulating greater usage of existing customers. Widely varied applications of electric heat, the great opportunity for improvement of lighting and the various uses of air conditioning for improving processes, working efficiency or customer comfort are available.

Developing the Heat Load—Midget

Extent of New Industrial Business Secured in 1934— Its Source and Prospects for 1935

The thirteen operating companies giving data tabulated reported total sales to all classes of customers as 16,700,000,000 kw.-hr. for last twelve months, of which nearly 507,000,000 was added in industrial load, or a 7 per cent increase.

Company	A	B	C	D	E	F	G	H	I	J	K	L	M
Rank for Total Output	1	2	3	4	5	6	7	8	9	10	11	12	13
Industrial Consumption	3	2	1	7	5	11	8	6	4	9	10	12	13
Extent of industrial consumption (exclusive of commercial) 1,000,000 kw.-hr.	901	941	972	607.2[a]	689.3	270	604.4[c]	661	789.5	601	416.8[c]	225	52.5
Per cent of total sales	33.4	50	57.4	39.8	50	19.8[a]	51	56	69.5	65.8	52.5	30	30[b]
Gross addition of industrial business (est. 1,000,000 kw.-hr. per year)	62	55	1.9	.....	30.5	4.3	.....	43.3	55	37.2	.....	10	5.9
Gross loss of industrial business (est. 1,000,000 kw.-hr. per year)	49.7	0	....	.....	2.9	0	.....	20	15	2.8	.....	0	.....
Net increase of industrial business (est. 1,000,000 kw.-hr. per year)	12.3	55	1.9	73.1[c]	27.6	4.3	134.5[c]	23.3	40	34.4	84.3[c]	10	5.9
Net increase in power sales—per cent	1.4	6.2	0.2	13.7[c]	4.2	1.6	28.6[c]	3.7	5.33	6.1	25.4[c]	4.7	12.7
Per cent of gross increase due to:													
Replacing isolated plants	6.8	0	16.2	.....	21.2	0	.....	4.1	31	33	.....	15	0
Interchange of power	0	0	....	.....	(d)	0	.....	0	13	0	.....	0	0
New customers	16.2	Very few	36.8	.....	32.1[d]	35	.....	6.3	9	18	.....	25	Very few
Reconnecting old customers	0	.....	....	.....	31.5	16	.....	4.1	20	5	.....	15	0
Added usage of existing customers	77	Nearly 100%	47	.....	15.2	49	.....	85.6	27	44	.....	45	Nearly 100%

(a) Includes sales to other utilities and interchange. (b) Per cent of direct consumer sales. (c) Includes large commercial with industrial.
(d) About 1,000,000 kw.-hr. is from interchanging power or 10 per cent of that attributed to new customers.

Sources of Business Secured

Letter ahead of each group indicates utility company reporting. Figures after each industry represent estimated annual consumption in 1,000 kw.-hr. of new business or per cent of class-business added.

Substitution of Purchased Power for Private Plants—C—Railroad; E—paper and products (4,900); ice plants (703); mining operations (500); corn, flour, and feed milling (176); cotton ginning; H—coal, ceramic, chemical, dairy; I—ferrous and non-ferrous metals (53%); glass (25%); coal (8%); miscellaneous (14%); J—grist mills, gins, ice plants, and oil mills. L—Textiles, paints, malting.

Interchange of Power—I—Ferrous and non-ferrous metals (100%).

New Customers—A—There is no dormant industry in this territory; E—foundries, iron and steel works (7,000); mining (558); paper and products (288); miscellaneous (230); ice plants (150); quarrying (136); food products (115); woodworking (105); textiles (80); corn, feed, and flour milling (64); water-works (30); cotton ginning (27); F—paper, cotton, and machinery makers; H—coal, glass, tools, printing, electrical equipment, wax paper, warehouse, brewing, and liquor blending. I—chemical and research (24% apiece), coal and miscellaneous manufacturing (21% apiece), construction (10%); J—grist mills, textiles, packing, refrigeration.

Old Customers Reconnected—A—No industry is dormant here; E—textiles (8,750); foundries, iron and steel (338); mining (138); food products (124); woodworking (90); ice plants (80); cotton ginning (40); brick plants (37), water-works (12), corn, feed, and flour milling (8), miscellaneous (4); H—brick and stone; I—glass (47%), coal (46%), miscellaneous (7%).

Increased Usage of Power—A—No industry is dormant in this territory; B—automobile, steel, breweries; C—breweries; E—textiles (1,783), mining (1,608), cotton-oil mills (440), ice plants (249), quarrying (168), food products (111), corn, flour, and feed milling (104), woodworking (62), miscellaneous (61), foundries, iron and steel (58); H—various types and wide variety with no industry dominating; I—ferrous and non-ferrous metals (46%), coal (22%), chemical (16%), sand, stone and gravel (6%) glass (5%), construction, oil refining, food products and miscellaneous (1 to 2%); J—textiles; metal working, typewriters, fire arms, tools, machinery, foundries. L—General power for metal, brewing, textiles, malting.

Applications dominating increased usage—A—air conditioning, electric heat applications, lighting; B—air conditioning, electric heating and melting; F—miscellaneous heat applications and power service; H—various types; I—motive power for new processes (71%), electric melting, annealing, electrochemical, etc. (26%), lighting (3%), J—textiles; M—industrial applications of electric heat and lighting.

Reasons for Expected Increase

A—Will concentrate on air conditioning and lighting equally with possible addition of material handling; B—will concentrate on air conditioning, electric melting and heat applications.

E—Hope to secure 32 new customers composed of mining (2,360); woodworking (822); water-works (309); textiles (240); food products (60); foundries, iron and steel works (60); ice plants (30.9). Hope to reconnect 38 old customers composed of cement plants (9,000); textiles (4,125); cotton oil and fertilizer plants (1,005); mining (500); corn, flour and feed milling (252). Hope to replace seven isolated plants composed of textile mills (2,800); ice plants (650); water-works (175); cotton ginning (44). Hope to increase usage of existing customers as follows: Foundries, iron and steel works (4,000); paper and products (3,500); mining (660); woodworking (500); textiles (146). Of the total increase of 31,138,900 kw.-hr., about 29% is expected from cement plants, 24% from textiles, 13% from foundries, iron and steel works, mining 11% and paper and products 10%.

F—Out for all possible worth-while loads regardless of size or type, although will drive hard for larger industry patronage.

H—Increased sales effort and improved business conditions. To what extent the use of service will be increased is impossible to predict on account of uncertainty regarding improvement of business conditions. Plan to concentrate on lighting, large heating, small heating, closing down of isolated plants, general power and air conditioning. Amount of time devoted to each will vary with salesmen and conditions and prospects in their territory.

I—Both ferrous and non-ferrous industries will continue to provide new loads. This group is spending money. Increases will come from chemical industry—quite busy and continually developing. Best of glass companies will provide increases on account of their continual search for new and better processes. Although field for further mechanization in coal industry is quite large, increases will not materialize in 1935 because predominance of labor and coal-market troubles create unfavorable situation for further modernization. Will concentrate on (a) motive power for new processes, including air conditioning and ventilation, (b) electric melting, heat treating, and miscellaneous heating, (c) electrochemical, ionization and heating (d) lighting; adjusting sales efforts as found needed by continuous surveys.

J—Plans to concentrate on textiles (40%), wholesale municipalities (20%), air conditioning and industrial heating (20%), miscellaneous (10%). K—Will devote 75% of one man to industrial heat applications and 10% to lighting. L—Will concentrate on various applications of electric heat.

heaters for various industrial processes are continuing to afford the greatest opportunity for expansion of electric heat applications. While not as spectacular units as electric furnaces, the usage of midget heaters is impressive for collective consumption and revenue production. Besides, they educate users to more extensive application of electric heat. As a result of market surveys, demonstrations and methods of convincing skeptical persons of the advantages of electric heat, C. P. Yoder, Buffalo, Niagara & Eastern Power Corporation, reported[1] that 1934 usage of electric heat was increased 360 per cent over 1933 and revenue 272 per cent.

Another group of operating companies in the East has been active for four or five years on electric heat and done an excellent job.

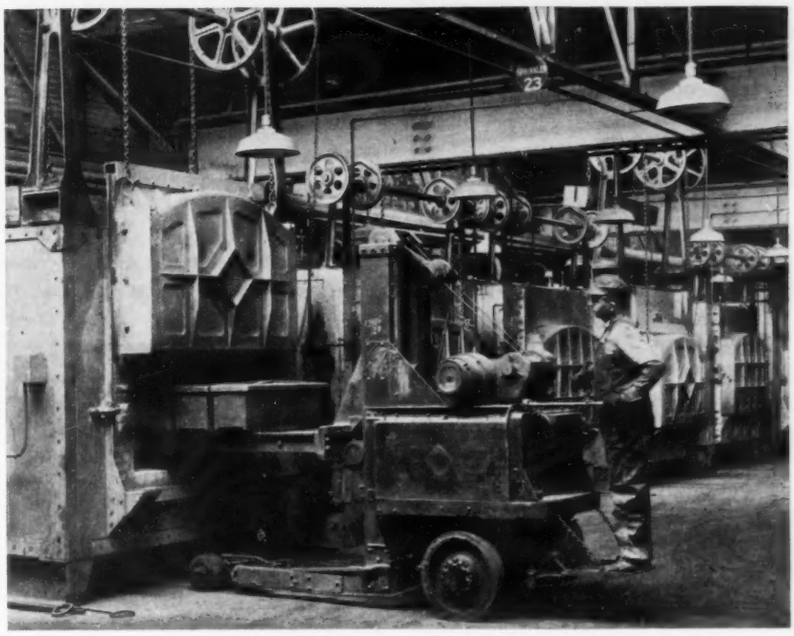
This group of properties, operating in scattered industrial territory with about 60 to 70 per cent of its total output for industrial power, added during 1933 nearly 6,300 kw. in midget heaters, of which 2,924 kw. was for (a) vulcanizers, welders, strip and space heaters, etc., 2,106 kw. for (b) restaurants, confectioneries and small cooking.

Considering all electrical applications, large and small, served on power rates, this group added nearly 100,000 kw. during the five years 1929 to 1933, inclusive.

Applications of electric furnaces and ovens have not been lacking during the past year, as recorded elsewhere in this issue. Among the processes for which they were used were: Melting iron and steel, making high-test cast iron; duplexing and superheating; making alloy-steel ingots and castings; annealing high- and low-carbon steel, sheet brass and copper; heat-treating tools; malleableizing; melting non-ferrous metals; drying paint and enamel; vitreous enameling, and glass manufacture.

Electric melting of metal has become the most popular heat application in one territory where a maximum rate of 1.2 cents per kilowatt-hour has been offered for this purpose by the utility, although some companies do not favor special flat rates.

Air Conditioning — Nearly every utility sales manager whose experience has been sought on the best market for air conditioning and how to sell it has declared that C. E. Michel's report[2] to the E.E.I. is the best answer. Individual attack, or at least group approach, is essential. Usually the utility procedure is to bring prospects to the point of interest and then call in manufacturers and heating and ventilating contractors to quote prices, cost of operation, etc.



Electric heat applications afford attractive market

Lighting Opportunities—The new demonstrational approach[3] of helping industrial prospects sell themselves on the necessity and value of better illumination is meeting with widespread response. Through the medium of the traveling schools that held five-day demonstration courses in 52 cities throughout the United States during the past year every power salesman should have had the opportunity to see the effectiveness of this selling approach and be able to apply it in securing new business.

Improvement in industrial lighting is more needed[4] than ever before, but it is believed that concentration on supplementary spotlighting for meticulous tasks affords the best opportunity to stimulate general illumination revision in commerce and industry.

New Uses—Most companies have always impressed their salesmen with the necessity of finding new applications for power. Dissatisfied with this individualized, unco-ordinated, unconsolidated effort, the West Penn Power Company has been applying several men full time on developing process-flow-charts of the major industries.

An immensely valuable asset is being developed by this means, according to many companies interviewed.

Developing Border-Line Business—Various methods of interesting industrials in purchased electric service are being employed when they are indifferent to the proposal because of available waste heat or large process-steam requirements. Combined steam-and-electric service, interchange of power and joint ownership or leasing of plants constitute the major incentives offered by utilities.

C. Benham, Rochester Gas & Electric Corporation, reported last summer[5] that it had been impossible for years to connect the Stecher Traung Lithograph Company, which operated a steam-electric generating plant jointly with its neighbors. Finally it was secured by purchasing the plant and selling the company power and steam at less than their former cost, made possible by economies.

Interchange of power between utilities and industrials is practiced in different places. W. A. Hanley, director of engineering Eli Lilly & Company, speaks[6] enthusiastically of one such arrangement with his company. Among

[1] ELECTRICAL WORLD, October 27, 1934, page 30.

[2] ELECTRICAL WORLD, July 14, 1934, page 55.

[3] ELECTRICAL WORLD, September 29, 1934; October 27, 1934, page 34.

[4] ELECTRICAL WORLD, November 24, 1934, page 56.

[5] ELECTRICAL WORLD, June 16, 1934, page 863.

[6] ELECTRICAL WORLD, June 23, 1934, page 913.

benefits were: Greater reliability than with an isolated plant, minimum investment, no stand-by power plant losses, exceptional heat balance, arrangement for obtaining electricity and steam economically regardless of magnitude of either, elimination of coal and ashes.

Selling Centers on Homes

Striking increase in appliances sold this year and even better results expected next year — Rate reductions and changes aid in selling — New plans and methods used — Notable advance in lighting

INTEREST has centered in the home this year. Power companies have focussed their selling there as never before. It was the thing to do for many reasons. The domestic consumer represents 20,520,870 out of the total of, say, 25,000,000 customers of the utilities and, therefore, provides the greatest market opportunity. Moreover, every commercial and industrial customer is also included among the domestic consumers and can be reached most intimately there. It is the universal point of contact. And at this time of public clamor for lower rates the fortunes of the power company rest upon the popularity of its service to the home.

Because of the depression, neither the factory, store nor office has presented a hopeful field for rapid development. The household use of electricity has been so small, however, and the appeal of modern electrical appliances has become so strong and public interest has been so increased as a result of the wide publicity that has grown out of President Roosevelt's enthusiasm for the social benefits that come from electricity in the home that the domestic market has offered immediate possibilities for load building. So there has been a large increase in selling by the power companies.

A recent study of the merchandising activities of more than 100 power companies, serving some 10,400,000 domestic consumers throughout the country, was reported in ELECTRICAL WORLD of December 8. It covered the first nine months of the year, compared with the same period in 1933. It showed striking increases in the number of appliances sold—ranges 124 per cent, water heaters 152 per cent, clothes washers 20 per cent, ironing machines 73 per cent and 34 per cent more cleaners and small appliances, taken as a group. This included flatirons, heat pads, table cookery devices and the rest. The total dollar value of appliances sold by these companies during this period was up by 37 per cent. The number of salesmen employed in domestic load building increased 16 per cent and the expenditure for advertising and promotion grew by 29 per cent. The number of domestic consumers on September 30, 1934, was 12 per cent larger than a year before. In fact, the power industry today serves 300,000 more customers than it ever has before.

This report embraced practically one-half the domestic consumers in the power industry. It showed such sizable sales totals as 111,492 refrigerators, 40,977 ranges, 14,564 water heaters, 54,453 clothes washers, 11,713 ironing machines and 616,203 cleaners and small appliances, with total sales value of $37,558,062 by 4,782 salesmen and $2,693,247 spent for advertising. And this, of course, did not include any appliance sales by dealers, which may vary from 50 per cent to 75 per cent or more in these communities. In other words, a large enough volume of these appliances was sold this year to prove that it can be done. Where ranges have been sold in hundreds in the past, they will be sold in thousands in the future. And the goal should not be the complete electrical equipment of a few million homes, but the large proportion of this.

There was encouraging evidence this year that this new concept of universal use is dawning. The spirit of large scale selling is beginning to be seen. In has come, out of the competitive pressure for lower rates, that has sprung from the T.V.A. "yardstick" program. It has taken the form of reducing rates, of making it easier for the customer to purchase appliances and the intensifying of selling activities.

Rate changes aid sales

The movement of rates has been impressive. In the last ten years the average cost of electricity for household use has fallen from 7.20 cents per kilowatt-hour in 1924 to 5.30 at the end of 1934, a drop of 26 per cent. But this year has seen an unprecedented procession of rate reductions affecting the domestic customer. Month after month new revisions have been reported, with a proportion of voluntary cuts that is unusual. And the wave would appear to be but starting, as the number of companies that are in the process of preparation for downward rate adjustments is considered. The industry is gradually accepting the idea that lower rates open the door for load development, that rate cuts should always be accompanied by a selling campaign and that the reduction should come first, then the selling. The old approach used to be: "If we cut this rate what revenue will we lose?" The new school of thought says: "If we make this price what load can we build?" It is a positive rather than a negative attack upon what is, after all, a market problem. It holds the promise of much progress.

Some of these rate reductions have taken the form of special inducements in free electricity. The San Joaquin Light & Power Corporation, the Pacific Gas & Electric Company, Milwaukee Electric Railway & Light Company and the Hartford Electric Light Company have experimented with this idea with apparent success.

The industry has long toyed with the idea of making it easy for the customer to buy appliances. It has become general practice to sell on installment payments. This year has seen the extension of the idea to the renting of ranges and water heaters. Depression conditions have made it doubly hard to bring the prospect to the point of purchasing. Lacking the cash, he has been afraid to buy. And so power company men have begun to experiment in renting ranges and water heaters, following the successful

experience of British and European utilities. At last count some 48 American companies scattered over 23 states are renting ranges or preparing to, notably those companies serving Reading, Mass.; Beaumont, Detroit, El Paso, Hartford, Kansas City and Orlando. Under the plan that these companies are following, the rental, trial-rental or trial periods become, in effect, the introductory process of selling. For at the end of a year, when the customer has become accustomed to the use of the range, there is a follow-up to convert the rental to a sale. In 75 per cent of the cases the customer buys the appliance at that time.

Because this rental plan, though postponing actual sale, results in building load and increasing revenue more easily and quickly, there is every indication that the practice will spread and grow in popularity both among the power companies and the public. Undoubtedly it will also be extended to ironing machines and to small refrigerators rented to minimum bill customers.

The minimum bill problem has become increasingly acute as taxes have grown and rate reductions become more pressing. Close onto half the domestic consumers on some systems pay no profit today. It is a challenge to every sales department that has been answered by a national small appliance campaign organized under the Edison Electric Institute in co-operation with the manufacturers. It has led to increased activity in merchandising table cooking devices.

A number of companies have also made intensive house-to-house drives upon these non-profit consumers, selling toasters, cookers, reading lamps, larger bulbs or other special numbers. But such efforts have made but little impress upon this great inert market. A salesman may convert two homes a day and many salesmen may be employed, but little headway is made in a city where there are, say, 250,000 minimum bills. The problem still waits for adequate solution. It may lie in the direction of renting chest type refrigerators, so that every customer converted to the paying basis will balance many still unprofitable. Success in selling these units to small consumers in Cleveland, Atlanta, Beaumont and other cities would seem to indicate that there is something to be done in that direction.

Present marketing plans

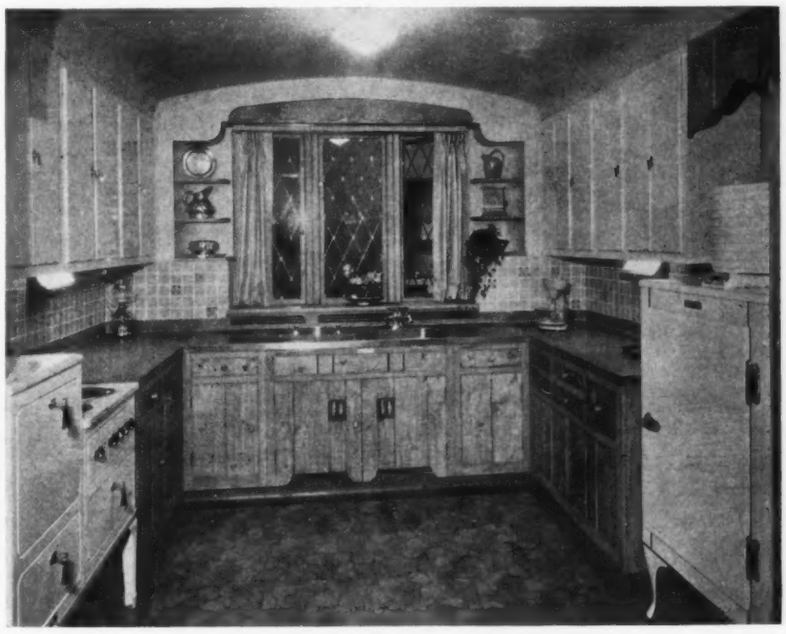
The hope of the industry today lies in three directions—cooking, air conditioning and better lighting in the home. The old prejudice against the cooking load is crumbling fast under the urge of necessity. The development of the T.V.A. models was a powerful impulse, but the need for load is the driving force. Companies that have never warmed to electric cooking are now selling ranges. Companies that have played with it before are now making it a serious business. Some combination properties are facing the need for this load to save their electric situation and adjusting themselves to the idea of active competition between gas and electric cooking.

The E.E.I. air-conditioning committee advanced the development of this load materially last summer by printing a comprehensive report on the scope, use, advantages, promotion and technical aspects of air conditioning, to guide large, medium and small companies based on the experience of sixteen utility systems. No data are yet available to show how many companies are today selling air conditioning, but the number is growing rapidly. Practically all commercially active power companies are today working into this field.

Home lighting has been greatly advanced in 1934. The sight meter, the home demonstration kit and the science of seeing, developed by the lamp industry, have staged a renaissance in the lighting art and its first expression has been in the home. From coast to coast utilities have been holding sales schools and retraining personnel in the new approach to lighting sales. Home service women have been assigned to lighting demonstration and there are today probably double the number of sales drives actively engaged in lighting that the industry had working two years ago. In addition there have been a large number of all-employee sales devices that have been most productive. In some cases they have enlisted many thousands in a short period of spirited canvassing that piled up huge figures for estimated annual revenue. The new I.E.S. study lamp will be popular merchandise in the year ahead and aid in the steady increase of this load. A large number of companies are conducting Better Light-Better Sight campaigns. Probably 80 per cent of the industry is making customer surveys.

Co-operation is playing a steadily growing part in the load-building program. Power companies now appreciate the value of the dealers' help as they have not before, because they see him as added man-power for appliance selling. The financing of dealer installment sales, the paying of commissions to dealers on ranges and water heater sales, co-operative advertising, the sharing of leads and the payment of commissions to company salesmen on load built by dealers are all gaining acceptance as practical measures for stimulating dealer activity.

But there is still much independent



Load building has focussed on the kitchen

experimenting and delay in the adoption of proven methods. It is perhaps the weakest spot in the present commercial operation of the power industry. There is great need for more uniformity in policy and method, the standardizing of the most effective practice. It will come, and the proficiency of the average sales department will be much improved.

Commercial Sales Hold Level

Air conditioning and highway lighting make progress — Store, office and street lighting sales affected by the depression — Expectations are for an expanding market during the coming year

NO GREAT strides were made in the development of commercial load during the past year. The utilities have fought a hard, defensive battle all along the line to hold their lighting business and have capitalized the growing popularity of air conditioning to make good their losses. In a word, that tells the story in so far as stores, offices, commercial and public buildings are concerned.

General business has been bad and the merchant has been living off his hump so long that there has been steady pressure to reduce lighting intensities in stores and windows and to let signs stay dark. The frugality complex has swept the store as well as the home, and it has been a hard fight to maintain consumption. There has been little active building of new business, except in certain of the large cities.

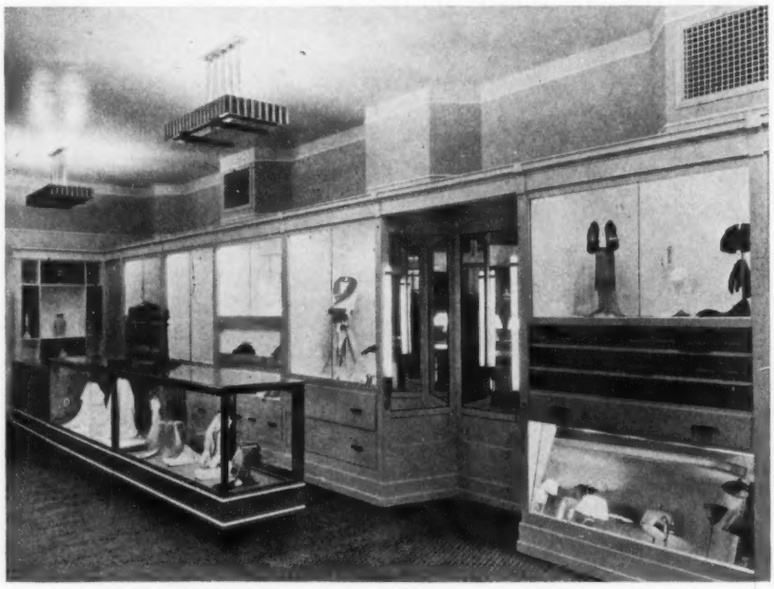
The science of seeing was a timely aid, for it has provided a basis for the discussion of lighting in any store, office or other building on a constructive plane. Instead of fighting to hold his wattage, the salesman reopens the whole question of what kind of light and how much is economical and useful. With the development of the commercial lighting demonstration kit this summer by the lamp companies, the utilities began to build up the commercial lighting forces and will show large gains when the tally is cast at the close of the campaign this spring. Meanwhile, there have been some notable installations of advanced lighting in schools—Cleveland, Mansfield and Mt. Lebanon, for instance—that indicate a very large development ahead, through the improvement of working conditions in the classroom to safeguard the eyes.

There have also been some outstanding department store installations using the two-filament lamp to provide varying intensities for different hours of the day. Many splendid examples of window lighting, floodlighting and the illumination of special interiors have been recorded. Demonstration sections of modern highway lighting have been developed—notably in Asbury Park, Lynn, Schenectady, Detroit, Bay Shore and Tribes Hill. Demonstrations have been made to show the value of sodium vapor and high-pressure mercury lighting as a protection against the rising tide of traffic fatalities. But all in all it has been a hard year in which commercial lighting has fought to hold its own.

Air conditioning advances

Air conditioning has had a happier time in 1934. Broadly speaking, there has been a substantial increase in the volume of business done. Apparel shops, restaurants and theaters led in this program, with drug and department stores following fast. A considerable number of offices and department stores were air conditioned during the year and a real start made with hotel guest rooms. Railway air conditioning has expanded to the point where the traveling public is demanding it, and its influence on the popularity of the air conditioning idea is far-reaching.

Commercial refrigeration has also continued its progress slowly. The sale of small heating equipment to lunchrooms and roadside stands has been pushed by several companies. Interesting installations for hotbed sprouting, electric insect traps to supplant orchard sprays and a variety of ingenious special applications attest the ingenuity and zeal with which the engineer and the salesman have both pursued the commercial customer. The year shows little progress, however, when the volume of consumption is considered. But it has been a good fight against odds that will react in a broad development of diversified load as general business continues to recover.



The fight to hold commercial lighting has been well won

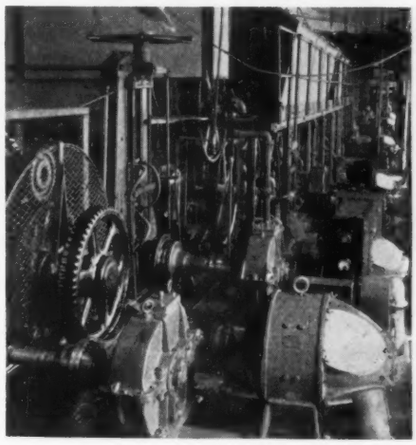
How Industry Is Modernizing

Substations, Distribution, Switching, Metering, Motorization, Heat Applications, Lighting and Control Are Being Improved to Secure Production Advantages

DURING the past year a number of industrialists realized that they cannot compete profitably in the present market without up-to-date service and productive equipment and step-by-step modernization has been undertaken. Some electrical modernization steps which have been reported are related to indicate opportunities open to other industrialists who have overlooked the fact that it is possible to save or make money by spending money judiciously.

Making Power Supply More Reliable—To keep pace with improvements made by utilities in their service facilities and assure reliability of power supply within their factories a number of industrials have replaced inadequate circuit breakers and old instrument transformers which could not withstand voltage disturbances that get past arresters with modern protective ratios. Where sufficient substation space has not been available indoors to accommodate larger capacity breakers, increased circuit clearances, etc., outdoor substations have been found to remove this limitation and release space indoors for productive purposes. Equipment is frequently housed in cubicles or cabinets, whether indoors or outdoors.

Wiring for Service—Layout of circuits, switching and service connections so adequacy, continuity and flexibility of service can be assured has been found particularly advantageous during the last five years and scattered applications have been made in industry recently. In the Bendix Corporation's plant, for example, ample circuits with frequent outlets are arranged so that machines can be easily rearranged and connected without running new circuits. In some recent paper mills, says A. P. Schnyder, consultant, all motors are served from motor-group control centers, fed in turn by radial feeders from the main switchboard. Push-button control is located at each motor except where it



is within unobstructed view of the group control. D. K. Frost, Mattison Machine Works, reports* that wiring of machine tools with built-in electrical equipment has been greatly improved and protected where wiring and the layout of motors and control panels are given more attention before designing and installing the machines.

At least two departures from orthodox methods of running industrial circuits are finding application:

One is an improved form of inclosed bus. Branch circuits can be readily moved from one point to another as new loads or changes in load are required without the unsightly appearance or hazard of temporary wiring. Only the investment for immediate circuit requirements need be made, while additional capacity and circuits can be added any time without sacrifice of any of the original layout, it is reported.

Another system of distribution is for feeding portable tools along assembly lines. Riding on the bus within a duct and attached to the portable tool is a small trolley carriage equipped with fused cut-out switches, manual motor starters with overload protection, or both.

*ELECTRICAL WORLD, February 3, 1934, page 195.

Instrumentation Aids Economies—Advantage is being taken by some industrials of the opportunities which recording, indicating, integrating, totalizing and remotely operated meters afford to effect economies in production and operation. Use of portable instruments has aided proper motorization and determination of adequate circuits and protective equipment. Meters installed permanently on individual machines are indicating to the operators when they are working them under or above capacity. Other permanent meters enable separating departmental costs. Grouped in the supervisory head's office, they have aided in many management problems such as getting the maximum use out of the investment in machinery, checking uniformity of quality, etc.

Lighting for Efficient Work—A widespread interest in improving illumination has been awakened during the past year by sight meters and demonstration kits showing the close relationship betwen seeing ability and quality of workmanship, productiveness of labor and the utilization of capital invested in machines. The new adequacy specifications issued during the past year come nearer giving proper guidance for illumination than old standards, including state, labor and insurance requirements.

R.L.M. reflectors, glass-steel diffusers and mercury-tube lighting are still excellent sources of general illumination, but attention is now being directed to concentrating supplementary light on meticulous tasks. In doing so direction of light, avoidance of glare and extreme contrasts are being given more consideration. Tests have proved that it is undesirable to have a greater ratio than 10:1 between the illumination of the work and its background, which means that general illumination has to be increased usually where spot lighting is added. Moving work has been found to require much higher intensities.

Motors Adapted to Processes—Industry is beginning to recognize that many new developments have been made which can be substituted for obsolete equipment that is handicapping them in the present highly competitive market.

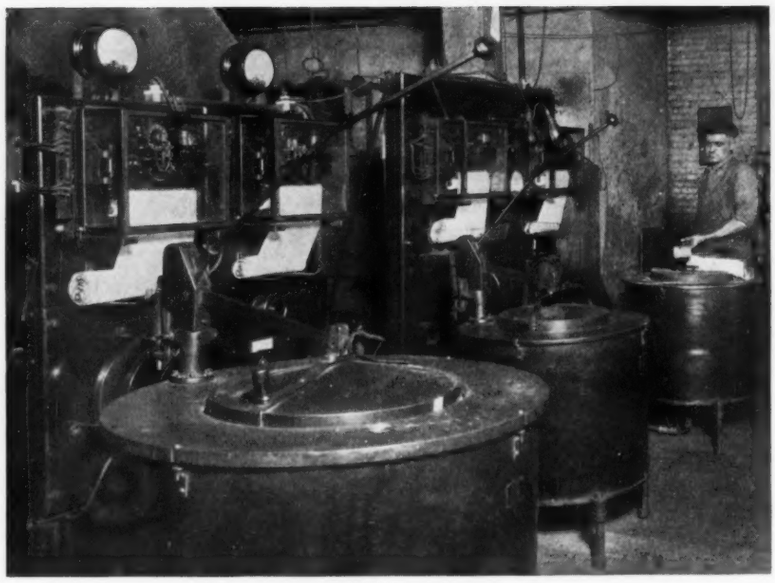
Gear-head motors that utilize small motors of 1,800 r.p.m. are being connected directly to machines without additional reduction gears, or other transmission devices, because of their compactness and ease of application. One striking case is in a fiber plant where the rolls rotate so slowly that their movement is hardly perceptible. There, a single external gear on each drum supplements the 12:1 speed reduction accomplished in the gear-head motors.

With increased co-operation between industrialists, machine-tool builders and electrical manufacturers, built-in motors and control are more nearly meeting the various requirements of users and giving the advantages that come from combining the machine, its drive and control into an integral unit that can be mounted or moved where it will best fit into the production requirements.

Efficiency of material handling, which is a part of every industrial management problem, is being given more attention. As Harry E. Stocker, Newtex Steamship Company, and Col. P. L. Gerhardt of the N. Y. Inland Terminal said recently in characterizing methods used: "Keep the material moving toward its destination, but employ equipment that can be utilized 75 per cent of the time." Tractors with automatic-coupling trailers, portable articulating conveyors, electric-lift and tiering trucks and larger elevators are some types of equipment which are used.

A.c. operation of cranes and hoists has been greatly improved by the Pittsburgh & Lake Erie Railroad by revising the reeving of hoist, trolley and bucket ropes and taking better advantage of electric equipment available, according to H. L. Lindstrom, Dravo Contracting Corporation. Replacement of steam with compressed air for forge hammers has saved the Woodings-Verona (Pa.) Tool Works about $8,000 a year on a $17,000 outlay for the motored air compressors.

The Homestake Mining Company, Lead, S. D., has equipped the ore and man hoists on a new 5,275-ft. gold-mine with interchangeable 1,500-hp. motors geared to bi-cylindro-conical drums. Two of these motors hoist a 12,500-lb. skip at 2,500 ft. per minute.



Industry is recognizing that instruments are essential to economical operation

Rapid acceleration of loaded centrifugal extractor baskets, electric braking and automatic timing have been accomplished by some Hawaiian sugar mills, using two-speed, direct-connected, wound-rotor motors.

Ford Motor Company has expanded its steel-rolling facilities by electric drive of a 44-in. reversing blooming mill, the direction and speed of which is controlled by interlocked forward and reverse pedals actuating a master switch, giving six speeds forward and an equal number reverse.

Reversing hot-strip mill operation has been accomplished by winding and rewinding the strip on rolls in furnaces on each side of the mill. The speeds of the reel motors and mill motor are co-ordinated electrically.

Just as practice in illumination swung from local to general and is changing to a combination of general and supplementary concentrated light, so is a combination of individual and modern group drives becoming considered the best solution in the motive-power field. Individual drive still has all the advantages it ever had, but elimination of many of the old objections to group drive has given the latter new life.

Capitalizing on Electric Heat Applications—Advantages of automatically controlled electric-heat applications such as uniformity of product, reduction of spoilage, smaller attention necessary, non-requirement of expensive fixed structures for delivery of fuel or steam and disposal of waste combustion products, flexibility of use, elimination of vapors in air, avoidance of uncomfortable working temperatures, and ability to locate units where wanted in the line of production, are becoming more widely recognized by industrial managements, judging from the electric-heat applications which are being made.

Less spectacular in individual size than electric furnaces or ovens, but growing rapidly in numbers in every industry, are the various applications of midget heaters—immersion, cartridge, clamp-on, strip type, etc. Wherever there is a use for heat they are finding applications, for example, in small plating tanks, driers, small ovens, fluid and solution heaters, heat treating, silk conditioners, melting pots, glue rolls or pots, for soldering irons, sizing mills, space heaters, harness rooms, pump and valve houses, metal melting, celluloid bending, fuel-oil preheaters, oil blending, vulcanizing, asphalt unloading, aging liquor and melting wax. Numerous other applications that have been made have been compiled with the methods of applying the heat by manufacturers of midget heaters.

But large applications of electric heat are also going forward. Tempering of demand charges by utilities has increased industrial interest in electric melting. Electric furnaces melting brass, bronze and bearing metals have been installed, but electric iron melting shows the greatest activity because of the premium on high-density, correct microstructure and physical properties.

Controlled-atmosphere electric furnaces are finding increased application, for example, in bright annealing copper tubing and nickel-silver blanks, copper brazing and heat-treating steel parts.

Electric melting of iron and steel is being widely adopted in the Detroit territory, where paint and enamel drying, vitreous enameling, melting of non-ferrous metals and glass manufacture are also aided by electric heat. In industrial districts of the East and Middle West are similar applications. Around Baltimore electric heat figures prominently in making Bethanized zinc-coated wire, ridding wheat of weevils, making high-test cast iron, and production of rustless steel. Around Hartford metal-working, typewriter, fire-arms, tool, machinery and foundry plants have found various uses of electric heat favorable. Gillette Safety Razor Company, Boston, is using eighteen high-frequency furnaces for heat treating razor blades.

Electricity replaces oil-firing for annealing

The Thompson-Wire Company, Mattapan, Mass., by using electric heat in place of oil-fired equipment for annealing, has saved $1.87 per ton with high-carbon steel and $2.65 with low-carbon strip. Electric annealing was found to be 35 per cent faster and gave a superior product. In eastern Pennsylvania four pretzel bakeries have electric ovens ranging from 45 kw. (rotary) to 225 kw. (traveler). The O'Sullivan Rubber Company, at its plant in Winchester, Va., has converted all its steam-heated platens, for curing rubber, to electric heat with gratifying results. It saves $10,000 a year, due to reduced cost of heat and reduced maintenance, eliminates steam vapor and slippery floors, secures greater uniformity of product and flexibility of operation and saves floor space.

At the Plymouth plant of the Chrysler Corporation nine 360-cycle induction-type enamel-baking ovens totaling 600 kw. have been installed in the last eighteen months or so, and have the advantage that they heat the enameled metal first so the enamel dries from the inside out, as proper. Sheet brass is being annealed by the Chase Brass & Copper Company at its Cleveland plant in a recently installed recuperative electric oven.

Top-charging electric furnaces have been installed in a number of cases for electric melting and refining where larger than 5-ton capacity per unit is required. The International Nickel Company is reported to have effected enough savings on its first 20-ton unit to justify the installation of a second, which was subjected to final tests December 8. The savings were chiefly in power, electrodes and man-hours attendance, refractory cost being about the same as or slightly lower than for door-charging units. The Norfolk Navy Yard is also using a top-charge furnace.

A large manufacturer of stainless steel ingots has added a 300-kw. high-frequency electric furnace to its other units and several such furnaces are being used for melting stainless steel for casting. A 13,000 lb.-per-hour continuous porcelain-enameling furnace rated at 690 kw. has been installed to enamel signs up to 4 x 10 ft. or 5 x 8 ft.

Electric welding continues to progress with development of equipment control and electrodes and increasing recognition of its versatility. Repairing, maintenance and supplanting of riveted or cast structures are some of its widest applications. Greatly increased fatigue values are reported for hydrogen-atmosphere welding. New electrodes capable of welding cast iron, high-tensile steel or operation in any position—overhead, vertical or flat—are expanding the field rapidly. Automatic control of current values, duration of power application and contact-pressure of joints is giving uniformity of welds, which was questioned at one time.

Control—an Essential Factor—The important part which control of motive power, electric heat and lighting plays in giving satisfactory operation is becoming more widely recognized in industry. Ruggedness, simplicity, protection against various external conditions, adaptability to combination with other standard equipment are features embodied in the new developments. Electronic, photronic and thermionic controls have been applied industrially in various ways.

Output of one of the rubber-extrusion presses at the Willoughby plant of the Ohio Rubber Company was automatically synchronized with the take-off conveyor speed by making the slack between the two actuate a variable reactor in the grid circuit of a "thyratron" control for the field of the conveyor motor. In paper-bag mills registry of the cutter mechanism with the printing on a continuous roll of paper is assured, even when producing 350 to 500 bags per minute, by photocells or brush contacts, either of which control the electrical register control. Photocell control also found application in an Eastern shoe factory where sticky, fragile rubber sheeting had to be protected from injury in the process. Champion Fibre Company saves $6,000 a year by using relays to trip non-essential loads and retain essential loads on mill generators when purchased power is interrupted. A Canadian paper company does likewise.

Automatic descaling

At the Bridgeport plant of the American Tube & Stamping Company automatic descaling of the white-hot steel at various points in its travel through the production department is accomplished by water sprays that discharge only when the incandescent steel is in view of a photocell. In a paper plant roll speeds are co-ordinated for production of various grades of paper by Selsyn control. "Part-winding" starting prevents objectionable voltage fluctuations in the Manistique Pulp & Paper Mill.

In a brewery premature starting of a blower, which delivers grain to other equipment that must be running first to avoid clogging, is avoided by using a multi-finger relay which does not permit the closing coil of the blower starter to be energized until the successive motors are started. In a Texas asphalt-mixing plant interlocking control prevents cutting short the proper mixing time, dumping from weigh hoppers into the mixer before the previous batch is discharged, or shortening the dry and the wet-mix timing.

Cold strip is being sorted automatically as it is cut, in one of the large steel mills, into three piles, one of which is oversize and another undersize, by a continuous electric gage. The latter operates contacts, thyratron-tube relays and a solenoid which causes the roll table to deliver the sheets to the correct pile. Proper-size sheets pass a photo-tube connected to a lot-counting relay which in turn controls a solenoid that staggers each lot in a pile, thereby simplifying inspection requirements and handling.

Electric equipment capable of effecting economies in industrial production is available for virtually every task. It remains for industrial engineers to capitalize on it.

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Favorable Facts Offset Politics

EVIDENCE is convincing that the electrical industry is steadily emerging from the depths of the depression. Energy sales are mounting, electrical products are being sold and all marketing conditions are favorable for a gain of at least 20 per cent in business volume this year. On the firing line of sales and service the facts are encouraging and a hardened, chastened and well-organized industry is ready and eager to go forward. Too frequently this promising situation prevailing in the field of contacts with its customers is obscured by the publicity about the episodes that occur in the upper levels of national policy and legislation. These will not stop industry progress in the marketplaces; in fact, some of their aspects create promotional effects to bring about sales.

Undoubtedly, however, the utility branch of the industry is being used as a "whipping boy" by the Administration. Threats instead of facts are being used to force rate reductions and to injure the credit standing of the utilities. Some $700,000,000 of federal funds are being poured into power projects on the plea of relief, yardsticks or conservation. These afford unfair competition, an excess development of power and propaganda that has no facts to support it, to destroy the public relations of the private utilities. Also, the Administration is driving a wedge between holding and operating companies and is attempting to destroy state regulation and replace it with federal regulation.

This situation is serious. It is developing step by step on a formidable front that seems to head toward government ownership of all utilities. It is high time that a clear and definite statement of the real objectives of the Administration with respect to utilities should be stated. The power companies have been patient and have offered full co-operation, but they cannot sit by if present developments continue. In self-defense they will have recourse to the court of public opinion and will institute protective legal actions. The public should have the privilege of deciding between private and public ownership, if this is the real issue. It is time for a showdown.

This hubbub in political circles is all much ado about nothing, and it injures the public interest. Look at the situation from the point of view of the customers of the industry. Electric service is a 2 per cent item in the budget of home owners. It has decreased steadily, as contrasted to the recent price of a beefsteak or other food product. If given away free it would not affect the price of living enough to compensate for the increases in other living expenses in recent months. And over the years, and even now despite increased taxes and other costs, the trend of domestic rates is downward. In all industry similar conditions exist. The average manufacturer finds that the cost of power is about a 3 per cent item in his factory costs. This cost has been decreasing steadily, and will continue to do so, yet other manufacturing costs are even now mounting rapidly. The customers have been first in the minds of utilities serving them and they are not forcing the anti-utility program. The record in price reduction and in service made by the utilities should be commended. Those who have furnished it have had only a fair return. There are no million-dollar income taxpayers in the utility business. Why should the government limit the ability of the industry to do the very things the government wishes to be done? The political situation cannot be explained on any logical or factual basis.

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Social Legislation Advocated

SOCIAL legislation to create reserve funds that will be used to mitigate the effects of unemployment and old age is in the offing. Charges for these reserves will be recognized as essential elements of cost in all business activity. Granted that these reserves only mitigate the hazards and that very little actuarial data are available, nevertheless the electrical industry would do well to study the subject in order to equip itself to bear only its fair proportion of these costs.

Some electrical manufacturers and utilities have already done much to try out plans for old age and unemployment reserves and a vast fund of experience is available here and abroad. While not conclusive, the evidence is helpful and permits valid studies to be made. In the utility field a reserve fund to take care of unemployment can be built up at a relatively small cost because employment is stable. This group would get off at least cost to employer and employee by creating their reserves independently of other industries. On the other hand, any old-age pension plan would cost from 15 to 20 per cent of the payroll for at least the first twenty years and consequently is a major increase in cost.

Legislation in Washington is taking form on the major premise of federal specifications and slight finan-

cial aid, but with state responsibility and operation with pooled reserves for all industry. The best opinion is that only unemployment reserves will be forced upon industry at this time. The electrical industry would do well to develop and institute its own unemployment reserve plan before legislation forces the adoption of a possibly more elaborate and expensive plan than is required by the actual employment conditions existing in the industry. It is good policy to anticipate social legislation.

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Engineering Brains Needed on Distribution

ADMITTEDLY the distribution problem is the toughest technological-economic problem of the many facing the utility industry during the next decade. How to cut cost of distribution and, if possible, increase reliability are problems that have been acute for a long time and, what is more important, are likely to become more so as time goes on.

Perhaps the unsatisfactory state as regards solution of this problem is no more so than that of the distribution problem in all industry. But may not some of the difficulty lie in the comparatively light concentration of man and brain power on this unromantic phase of the power industry? Certainly many of the larger utilities and manufacturers have given much more attention in the past two decades to generation and transmission than to distribution. The progress made in those fields has definitely rewarded the efforts exerted. Perhaps a similar concentration of effort on distribution problems will likewise yield fruit.

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D.c. Transmission Offers New Advantages

PRACTICALLY universal in its functioning as a system of transmitting electrical energy, the alternating-current system is not, however, without its imperfections. The constant potential characteristic does not always work out well on short circuits, the energy input to the fault increasing when one happens. Parallel operating stability is still much a problem, along with frequency control and maintenance of synchronism. To terminate a fault or interrupt a load there must be a break injected into the circuit. Arc-overs on insulators are not had with impunity; the line insulator does not attain that ideal of each being a lightning arrester. It is not at all simple to control direction and magnitude of power flow in tie lines. There are other shortcomings which rate almost as important as these.

The constant-current series circuit has persisted in street-lighting practice and in the Thury system in Europe, but has vanished in almost every other field. Now a revolutionary change is impending. Thermionic tubes give the constant-current series circuit a potentiality to avoid all the above-enumerated defects of the constant potential system and, maybe, without bringing a coterie of new weaknesses in its train. This principle and its practicality will be discussed at the A.I.E.E. winter convention two weeks hence,

In the past there have been periods when comparable innovations were announced by the great minds of those days and the younger engineers of today are prone to regret they were not on hand to hear the new concepts launched. They have only themselves to blame if they miss hearing Messrs. Willis, Hull, Bedford, C. W. Stone and Elder tell why d.c. transmission is just about to crowd the heels of present transmission practice.

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Research—And the New Things Ahead

AT NO TIME in the history of the world have there been so many new ideas, new inventions and new discoveries waiting for development as now. Especially is this true in the electrical and associated industries. Any one who circulates among electrical men these days bumps into new principles, new circuits, new things, new apparatus, new devices, new appliances, new products on every hand.

For research laboratories and individual research workers have not been idle during the depression. Instead, with production schedules relaxed, men employed in industry have found opportunity to work out developments pigeonholed during the delirious peak-days of 1929 prosperity. And men off the payroll and out of jobs are still men who think and invent, even more actively than ever, with time to concentrate on and perfect "pet ideas" that otherwise would have gone glimmering.

Thus, from an army of official and unofficial researchers and inventors, a flood of new ideas has poured in upon electrical manufacturers, supplying the electrical industry with new articles to market. Slowly but surely this crop of new thinking and new methods is changing the face of things technical—both in general methods and in details. A new world of electrical and engineering practice and processes is emerging. And woe betide the complacent or conservative electrical business man who thinks he can "sit tight" and let his competitors spring all the new ideas. He may find too late that such new products insidiously have captured his market.

Eternal vigilance is the watchword in this day when competition in ideas stalks not only within an industry and between competitors familiar with each others' methods, but also, and more seriously, in the form of new outside processes, fostered by unknown groups, that may wholly replace old-time products.

NEWS OF THE INDUSTRY

Rural Power Program Launched by Couch

Electrification of three Southern states planned — Experiment to be restricted at first — Consumers to get assistance in marketing products from utilities

Announcement has been made by the Arkansas Power & Light Company of a rural electrification program through which electricity will be delivered to 15,000 isolated farm homes in fifty-five Arkansas counties at approximately $6,000,000. Some 3,500 miles of new distributing lines would be necessary. Harvey C. Couch, president of the Arkansas utility and also head of the Mississippi Power & Light Company and the Louisiana Power & Light Company, made the announcement.

Amortization on monthly basis

Mr. Couch's proposal is to finance consumers in the purchase of a limited amount of electrical equipment, to build transmission lines to their homes and farms, to place amortization and rates all on a monthly basis, and to aid the farmers through assistance in marketing their chickens, eggs and butter, to pay these monthly bills. His experiments are first to be conducted in a restricted area in southwest Arkansas. If his first experiment is successful he expects to extend it through his territory, taking in the larger portions of Arkansas, Louisiana and Mississippi and some 20,000 to 25,000 farms.

According to the plan the three companies will make the full investment so far as the transmission lines and other distributing facilities are concerned. This, he figures at approximately $600 to the home. He estimates that the investment by the farmers themselves will be about $200 to the home, and his companies propose to carry this over a five-year period.

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Quebec Quits City Plants, Utility Executive Declares

Municipal ownership of public utility plants has been dying out in Quebec Province, James B. Woodyatt, president of Southern Canada Power Company, observed at the recent annual meeting of the company. Many municipalities in the province have experimented with power systems of their own, but in recent years, in order to get lower electric rates, lower taxes and better service, have been coming back to the private power companies, until now only 30 municipal plants exist in the province. Southern Canada Power has itself taken over nine municipal systems in recent years. Its rates, Mr. Woodyatt said, are lower than those of any municipal system in Quebec Province, lower than T.V.A. schedules in the United States, lower than rates in Saskatchewan, Nova Scotia, Manitoba (except in Winnipeg, where competition has been undermining municipal and private company credit) and lower than various states in the United States.

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P.W.A. Spent $2,000,000,000 in 1934; Plans New Program

Public Works Administration expenditures on all phases of recovery programs exceeded $2,000,000,000 in 1934, Secretary Ickes announced in a review of the year's accomplishments. The remainder of the $3,700,000,000 appropriated, excepting the returns derived from the revolving fund, has been allocated, the announcement said. Expressing the hope that Congress would grant additional funds to carry on P.W.A. projects already under way throughout the country, Mr. Ickes said that P.W.A. "has cleared its decks for action and can launch in short order whatever new program the President recommends and Congress approves."

More than 8,500 federal projects and 600 non-federal projects already have been completed. Construction is under way on many others, including the Grand Coulee and Bonneville dam projects on the Columbia River and the Fort Peck dam and reservoir.

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New River Hearing Deferred

On the request of the United States government a postponement has been granted by Federal Judge George W. McClintic at Charleston, W. Va., in the date of argument of preliminary issues in the federal action against the Hawk's Nest project of the New-Kanawha Power Company, the Electro-Metallurgical Company and the Union Carbide & Carbon Corporation. The hearing, which had been set for January 7, will be held February 11. The government asked the delay so that it might have more time to study the intervening petition, filed earlier this month, of the State of West Virginia (ELECTRICAL WORLD, December 8, page 42).

Washington Plan Sought for New York

Electric companies offer "Washington" rate plan to cut costs — Carlisle makes proposal in letter to legislative committee — City plant plans progressing — Consolidated Gas cuts dividends

New York City's electric companies offered this week to put into effect in the city and in Westchester County the "Washington" plan of rate reduction—a plan that resulted in a rate cut in the nation's capital of from 7.5 cents a kilowatt-hour to 3.9 cents a kilowatt-hour over an eight-year period. The offer was made by Floyd L. Carlisle, chairman of the board of trustees of Consolidated Gas Company of New York, in a letter to Senator Dunnigan, chairman, and Judge Mack, chief counsel of the New York State joint legislative committee to investigate public utilities, the text of which appears on page 69. The "Washington Plan" is worked out upon a basis of using an agreed upon rate base value and a fixed return upon this value to the utility. Earnings above this return are shared between stockholders and customers, the customers getting theirs in the form of rate reductions. This is the latest development in the New York City rate situation.

Plans progress on city plant

Co-operation between the federal government and the city of New York in building their own electric power plants was definitely agreed upon last week in Washington at a conference between federal and city officials. M. P. Davidson, representing New York City, and Basil Manly, vice-chairman of the Federal Power Commission, head of a committee named by President Roosevelt to effect co-operation between the city and the federal government, came to an agreement on the first stage of the program. The federal government will build a plant near the general post office to provide light and power for federal and city buildings in midtown Manhattan. The city will build a plant somewhere near City Hall to service city and federal buildings in lower Manhattan. There will be a connection between the two plants, possibly with cables laid part of the way along the city's subway system.

Mr. Manly, in Washington, announced that co-operation between the city and the federal government was already under

way. "I am very happy to say," Mr. Manly stated, "that substantial progress was made and a pleasing spirit of co-operation was evident at the first meeting between city and federal government.

"These plans are limited to supplying the actual needs of electricity for federal and municipal buildings and arise from the refusal of the companies controlled by the Consolidated Gas Company to make any reduction whatever in the rates charged the federal and municipal governments for electricity."

Consolidated Gas cuts dividends

Trustees of the Consolidated Gas Company, in the meantime, met and voted to cut the quarterly dividend payable March 15 from the usual 50 cents to 25 cents. In announcing the dividend reduction George B. Cortelyou, president of the company, pointed out that the company had an obligation not only to its customers and employees but also to its 120,000 stockholders. "Increases in taxes and operating costs," Mr. Cortelyou said, "together with the effects of reductions in electric rates and revenues in 1931 and other subsequent reductions in lesser amounts aggregating $11,000,000 a year, have combined to produce conditions under which the quarterly dividend must prudently be cut in half . . ."

In a radio address delivered December 23, Frank W. Smith, president of the New York Edison and United Electric Light & Power companies, maintained that rates could not be reduced arbitrarily. He declared any attempt to do so would menace the investments in the companies held by small estates, insurance companies and others. He pointed to the 50 per cent increase in city water rates as an example of what happens under city ownership of a utility. He emphasized the large amount of taxes the companies pay and pointed out that source of city, state and federal revenue would be removed if municipal competition destroyed the private companies.

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Utility Investors to Carry Protest to Congress

Dr. Hugh S. Magill, president of the American Federation of Utility Investors, has announced that the organization plans to petition Congress in protest against government competition in the public utility industry. "Honeyed phrases issued under the guise of high Administration authorities in Washington to the effect that the government drive against public utilities is directly centered on the watered stock of utility holding companies hardly tally with the true situation," Dr. Magill said.

"A Washington spokesman, cloistered behind the protection of 'high Administration circles,' has stated that the bonds of utility operating companies are as safe as government bonds. Yet the Association of Mutual Savings Banks, representing institutions with more than 13,000,000 depositors, in an official resolution stated recently that the gravest danger confronting that organization is the threatened duplication of utility plants by the federal government. These banks hold more than $600,000,000 in bonds of utility operating companies.

"The federation, organized for the purpose of securing a square deal for some 10,000,000 investors, is going into its fight with clean hands and is simply seeking equitable consideration and fair treatment before the bar of public opinion. . ."

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Court Bars Camden Delay

Request of the Public Service Electric & Gas Company for another delay in its suit to invalidate Camden's vote for a municipal light plant has been denied by the New Jersey Supreme Court. The latest continuance was to January 15. The company sought to delay the hearing to April 15. The court criticised both the Public Service Company and Camden City Solicitor E. G. C. Bleakly for the delay of more than a year in the case.

Carlisle's Letter to Legislative Committee

I have been authorized by the Trustees of the Consolidated Gas Company of New York to propose putting into effect as to our electric companies in the City of New York and Westchester County the so-called Washington Plan for rate reductions.

Our business deals so intimately with the public that the questions of its service, its properties, its rates and its earning power are all matters of proper and vital interest to the public no less than to those who have invested their money in the enterprise.

If private capital is to provide the means of rendering this essential service to the public, it must receive a fair return. On this point fair-minded men agree. But the spirit of the times demands that this return should be linked with some plan by which the public is given prompt advantage of the results of greater economies and greater earnings by reason of additional volume of business. Such a program the Washington Plan provides. It began with rates considerably higher than those in effect in our territory. By successive reductions over a period of years, the retail rates have been brought down to a point lower than ours. This has been accomplished, not only by company economies, but by a steady increase in the average consumption of electricity which is now higher in Washington than in New York.

Harris & Ewing

For its adoption and successful operation, the Washington Plan presupposes a spirit of frankness and genuine co-operation on the part of the companies and the community. It involves rates based on a limited return upon an agreed rate base from which any elements of water or write-up have been completely taken out. It faces realistically the problems of taxation, simplification of corporate structures, and revisions of rate structures. All these are details that require fair working out.

But the purpose of the plan is to provide lower rates and, by increased consumption, progressively lower rates, taking into account always the proper interests of employees and investors. It is with this end in view that we propose its prompt adoption in this territory, and ask for an early conference at which the first steps may be taken.

National Power Program Urged by Mississippi Valley Committee

Linking of private and public systems recommended to President Roosevelt in $1,000,000,000 project — Building of 500 dams in plan covering power, flood control, sanitation and conservation

Thirty-one states, those in the whole Mississippi Valley, are embraced in the latest proposal of the government to take a grip on power. The Mississippi Valley Committee, a subdivision of the National Resources Board, recommends to the President and Public Works Administrator Ickes a $1,000,000,000 twenty-year program with 500 dams to harness the river and its tributaries for power, flood control, sanitation, erosion, recreation and agricultural rehabilitation.

Prominent in the report is the insistence that full governmental control of the interconnection system must prevail. Nevertheless, the tone of the report is unusually co-operative and conciliatory toward private power systems, disclaiming wholesale federal ownership or competition. However, a more nearly final word on administration power policy will be exposed when the National Power Policy Committee makes its report a few weeks hence.

Co-operative, not competitive, policy

The report recommends that half the billion dollars should be put in self-liquidating power projects as a public works measure. Only 2,000,000 of the 12,000,000 or 16,000,000 kw. of potential hydro of the valley is reported to have been developed. Three-fourths of the undeveloped low cost and medium cost power sites are in the Ohio River system. Recognition is given to the competitive cost of fuel power, but conservation of the inexhaustible hydro must be observed as a potent factor of national economic importance. On the whole, the committee's main objective seems to be regulation of generation and transmission in the manner of the British Grid, co-ordinating public and private systems. Such a procedure would, says the committee, afford an outlet for excess capacity such as now existing, especially in Illinois. "This goal does not involve any great increase in the number of publicly owned lines," the report states, "especially if the private companies co-operate in effecting unification.

"The private companies will gain through increased use of their present facilities; through not having to finance, in part at least, new generating and transmission equipment; through lower investment costs, and through the advantages of improved stability of service and added sources of energy."

As to rural electrification, the committee urges active leadership by the federal government, involving subsidies possibly as high as 50 per cent of the cost of the pole line, but adds that this program should be confined to regions where there will be no competition with private investment. Amortization of the private capital and perhaps also of the government's contribution over the twenty-year period is suggested.

Among other recommendations were: Completion of navigation facilities on the main stem of the Mississippi and connections with the Great Lakes; extension of navigation on tributaries only where intensive studies indicate it is justified economically; a commission to regulate inland water transportation; unification of all forms of transportation as parts of a co-ordinated system; use of all methods controlling floods—channel improvement, levees and floodways and retarding reservoirs; a program of flood control on major tributaries such as the Ohio, Missouri and Southwest rivers, and at strategic transportation centers such as Kansas City; co-operation with States in promoting rural land zoning, land use, forestation, and restoration of grass crops; caution on further extension of irrigation in view of crop surpluses.

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Engineering Council to Meet in Washington

The annual meeting of the American Engineering Council will be held at the Mayflower Hotel, Washington, D. C., January 10-12. Coming at a period likely to approach an all-time high for Washington activity when Congress and the federal officials are lining up the program for 1935, the sessions will feature the relations of government to engineering development. On Friday, January 11, there will be a symposium of government plans participated in by representatives of the Federal Reserve, Federal Housing, Department of Commerce and other government leaders and another symposium by government authorities on work relief programs, public works, the Federal Stabilization Board and others. On Saturday, the closing day of the meeting, there will be a third symposium by government authorities of the National Resources Board and other government divisions.

Frederick M. Feiker, executive secretary of the council, will make an address on "Present Trends in Engineering Organization." Addresses will also be given by Ralph E. Flanders, president American Society of Mechanical Engineers, and by A. J. Hammond and L. J. Fletcher.

24 CITIES GET WIREPHOTO PICTURES

Associated Press Photo

On January 1 a 10,000-mile circuit began transmitting news pictures and facsimiles to Associated Press members. Photo-cell scanning gives a 100-line-to-the-inch reproduction. Beam travels across cylinder at one inch per minute. Synchronism maintained precise by tuning fork.

Acquittal Verdict for Martin Insull

Pronounced not guilty of embezzlement charges — Jury took eleven ballots before reaching decision — Faces second embezzlement case — Middle West preferred stock group acts on reorganization

Martin J. Insull was acquitted by a jury in criminal court on charges of embezzling $344,720 from the Middle West Utilities Company. The jury deliberated six and one-half hours, but was out fourteen hours and took eleven ballots. This is the second Insull trial, growing out of the collapse of the financial operations of the Insull utilities, that has ended in acquittal, Samuel Insull, together with sixteen co-defendants, having been freed by a jury in federal court in Chicago a few weeks ago.

The state charged that Martin Insull embezzled funds from the treasury of Middle West a year before its collapse in 1932. The money was used, according to the prosecution's evidence, in a desperate effort to recoup his personal losses in the stock market. Denying the charges from the witness stand, Mr. Insull testified his stocks were sold to Middle West in "a perfectly proper and moral transaction." He admitted that the market value of the stocks was considerably less than the amount he received for them but explained that he and other officials of the Middle West system were confident they would rise again.

The State's Attorney's office was unable to say what would be done about the trial of Samuel Insull for embezzlement, set for January 9, or the remaining embezzlement indictments against Martin Insull, one of which was scheduled to be called up January 15.

Reorganization plan adopted

The protective committee for preferred stock of the Middle West Utilities Company has announced that it had adopted the plan of reorganization dated September 24 and filed on October 23 under Section 77-B of the bankruptcy act. The committee also announced the adoption of two amendments to the deposit agreement of April 15, 1932.

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New Nema Committee

A new committee has been added to the standing committees of the National Electrical Manufacturers' Association called the committee advisory to the Bureau of Foreign and Domestic Commerce, Department of Commerce of the United States. S. Duncan Black, president of Black & Decker Manufacturing Company, is chairman. Members of the committee include: H. E. Fleming, the Conover Company, Chicago; Robert W. Gibson, General Electric Company, Schenectady; W. A. Grove, Edison General Electric Appliance Company, Inc., Chicago; S. L. Nicholson, Westinghouse Electric & Manufacturing Company, New York; Matthew Porosky, Holtzer-Cabot Electric Manufacturing Company, Newton Upper Falls, Mass.; W. E. Sprackling, Anaconda Wire & Cable Company, New York, and C. E. Volkhardt, Harvey Hubbell, Inc., Bridgeport.

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Brief History of the "Electrical World"

The ELECTRICAL WORLD (published under that name since 1883 and tracing its history back to 1874) is a consolidation of the *Electrical Engineer* (founded in 1882 as the *Electrician*) and the *American Electrician* (founded in 1896). Final consolidation under the title of ELECTRICAL WORLD took effect on January 1, 1906, the ELECTRICAL WORLD and the ELECTRICAL ENGINEER having been acquired by the McGraw Publishing Company in 1899 and amalgamated as the ELECTRICAL WORLD and ENGINEER, and the AMERICAN ELECTRICIAN, a McGraw monthly, having been absorbed seven years later.

The roster of past editors of the ELECTRICAL WORLD includes Carl Hering, Louis Bell, W. D. Weaver, T. C. Martin, C. O. Mailloux, D. H. Braymer and many other men prominent in the electrical industry—some, like those named, no longer living, and others, like W. H. Onken, Jr., A. S. McAllister, Frank F. Fowle, F. M. Feiker, and H. V. Bozell, still active in engineering and industrial service.

L. W. W. Morrow is now editor. Other members of the present staff are: A. M. Perry, A. E. Knowlton and Earl Whitehorne, associate editors; G. F. Wittig, statistical editor; H. S. Knowlton, New England editor; F. R. Innes, Western editor; C. W. Leihy, Pacific Coast editor; E. M. Glennon, assistant editor, and Paul Wooton, Washington correspondent.

COMING MEETINGS

American Engineering Council—Annual meeting, Washington, D. C., January 10-12. Frederick M. Feiker, executive secretary, 744 Jackson Place, N. W., Washington, D. C.

American Institute of Electrical Engineers—Winter convention, New York, N. Y., January 22-25. H. H. Henline, National Secretary, 29 West 39th Street, New York, N. Y.

National Electrical Manufacturers Association — Midwinter conference, Waldorf-Astoria Hotel, New York City, February 6-8. W. J. Donald, 155 East 44th St., New York.

EVENTS IN WASHINGTON

Notwithstanding the marked differences of opinion with regard to some work relief activities, rural electrification is certain to be one of the major projects making up the program.

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While a number of bills proposing authorizations for the construction of publicly owned utilities are before Congress, prospects are against their final passage. Expenditure of public funds on such projects will be left to the Public Works Administration, where their chances also are poor, due to the desire to concentrate allotments on projects that can produce employment quickly.

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The bill proposing the regulation of holding companies is much more drastic than had been anticipated. Since the experience with the securities bill it is believed that Congress will be inclined to enact a less drastic measure, with the idea of making it more stringent later if the need becomes apparent. The regulation of interstate power movements, which is included in the proposed bill, probably will be handled as separate legislation.

PAUL WOOTON,
Washington Correspondent.

Standard Gas Plans Intensive Load Building

Improvement over a year ago is sufficiently evident so far as volume of business is concerned to justify in 1935 a policy of aggressive load building by companies in the Standard Gas & Electric Company system, according to a statement issued last week by John J. O'Brien, president. "Public utility companies in the system are important elements in the prosperity of the communities they serve," Mr. O'Brien said, "and are actively backing all business recovery efforts of a local nature, including the modernization drive now under way directed by the Federal Housing Administration. Executives of our various companies express keen interest in the concerted efforts being made to stimulate business revival, believing that these efforts will be a leading factor in the improvement that has been predicted for 1935.

"It is in the belief that public utility companies can and should be leaders in business recovery that extraordinary efforts will be made by the Standard Gas & Electric Company group to increase the use of their services in the new year.

Roosevelt Approves E. H. F. A. Extension

Plans are under discussion to broaden financial program for purchasing electrical appliances — Utilities' stockholders to press suits — Mississippi cities form association to obtain T.V.A. power

Administration plans to extend the benefits received by residents of the Tennessee Valley from the operation of the Electric Home and Farm Authority to purchasers of electrical equipment throughout the nation were revealed by President Roosevelt at his press conference last week. He indicated that a program of this nature would be put into effect by co-operation with established private utility companies rather than through extension of federal operations. Many utilities, he added, were already doing good work along that line. Plans are still in the discussion stage, however, and represent an objective rather than a definite program, the President said.

T.V.A. court tests continue

Criticising the announcement that the Federal Power Commission had rejected a proposal that the government aid in seeking an early Supreme Court ruling on the constitutionality of the Tennessee Valley Authority, A. C. Garber, chairman of the Alabama Power Company preferred-stock holders' protective committee, has declared that the preferred-stock holders will push their suit testing validity of the T.V.A. "The stockholders' suit to challenge the validity of the T.V.A. program," Mr. Garber said, "was not instituted at the instance of the Alabama Power Company nor the Edison Electric Institute, and it will be continued with or without the concurrence of the power company or institute." Mr. Garber's proposal to Florence, Tuscumbia and Sheffield to join in litigation was rejected. These cities have applied to P.W.A. for loans, but delayed completing contracts while T.V.A. negotiated for the purchase of existing facilities.

An amendment to the original suit brought to prevent sale of Tennessee Public Service Company properties to the Tennessee Valley Authority has been filed in U. S. District Court in Knoxville, seeking to add the names of the utility company's directors as party defendants and to enjoin them from taking any further steps to promote the sale. The petition avers that it was the duty of the directors "to protect the corporation from the consequences of the proposed sale." Federal Judge George Taylor ordered the directors to show cause within twenty days why the amended petitions should not be granted.

With the purpose of obtaining T.V.A. power, forty-seven north Mississippi cities have formed the Northwest Mississippi Electric Power Association. The board of directors at the organization meeting was voted authority to act for the association in gathering data and presenting the association's petition for T.V.A. power in nineteen counties in North Mississippi.

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G. B. Buck to Receive Co-operation Medal

Gaylord B. Buck, general commercial manager of the Public Service Company of Colorado and president of the Rocky Mountain Electrical Association, has been awarded the James H. McGraw Medal for Co-operation for 1934. The medal will be given in recognition of the contribution he has made in the co-operative development of the market for electricity in the states of Colorado, New Mexico and Wyoming through a broad program of promotion and sales in which he has been the leader. The presentation will be made this month in Denver at a gathering of the tri-state electrical interests. The judges who selected Mr. Buck for the award were E. R. Acker, president of Central Hudson Gas & Electric Company; A. E. Allen, vice-president of Westinghouse Electric & Manufacturing Company; J. G. Johannessen, vice-president of the General Electric Supply Company, and Earl Stewart, president of L. K. Comstock & Company.

We must look forward to new things, every day and every month, and every year—new things to contribute to our happiness and welfare, most and best of all new things in the home, where development has been too long delayed. More strength, then, to the G. E. Institute and to all similar institutions everywhere which encourage the invention, production, and distribution of those things which makes every man's home a "castle," protected by our laws from assaults without and garnished by our industries with comforts and conveniences within.

In a direct-wire address from his private office in New York to Cleveland, Ohio, Owen D. Young, chairman of the board of directors of the General Electric Company, on December 22, paid the above tribute to company officials assembled at Nela Park to celebrate the first anniversary of the General Electric Institute.

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General Electric Company to Wipe Out Debt

Program for the retirement of $49,371,948 of special stock and bonds was adopted last week by the directors of the General Electric Company at their regular monthly meeting. This will leave the company without debt and with a capital consisting solely of 28,845,927 common shares of no-par value. Funds for the proposed retirement are in the form of cash in the treasury, from which the company derives only a modest return.

The company will call the issue of 4,292,964 shares of $10 par 6 per cent cumulative special stock for redemption on April 15 at the call price of $11 a share, or $47,222,598, and will redeem on August 1, 1935, the $2,047,000 of 3½ per cent debentures due in 1942 at 105, or $2,149,350. In the last twelve months dividends on the special stock have made a total of $2,575,079. while bond interest has required $71,645, which will represent a gross saving of $2,646,724 in annual dividends and interest.

The special stock of the General Electric Company, created in 1922, was all issued as stock dividends on the common stock in October, 1922 to 1925, inclusive, and in July, 1926. More than 60 per cent of the debentures to be retired are held in the General Electric Pension Trust.

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Illinois Utilities Exempt from Occupational Tax

Electric, gas and water utilities, public and private, in the state of Illinois are not subject to the 2 per cent occupational tax, commonly called the "sales" tax, the state Supreme Court has ruled. The decision was rendered in reversing a decision of the Cook County Circuit Court which was appealed to the Supreme Court by the Commonwealth Edison Company, Public Service Company of Northern Illinois and the Peoples Gas Light & Coke Company. It is estimated that the ruling will cost the state more than $6,000,000 annually. The court held that the companies are engaged in rendering a service and not in the business of selling tangible personal property.

Doherty Write-Up Charged; Commission Issues Report

Charges that Cities Service Power & Light Company, holding company for the Henry L. Doherty electric light and power and street railway properties, wrote up its assets $82,000,000 between 1924 and 1930 were made at a recent hearing before the Federal Trade Commission. Randolph K. Ogle, commission examiner, testified that the principal write-up occurred in 1924, when Cities Service Power & Light was organized to take over subsidiary properties held by the Cities Service Company.

Robert Burns, Cities Service counsel, challenged the accuracy of the valuation, contending the examiner arrived at his statistics by comparing original cost of the properties between 1910 and 1913 with values in 1924. "During the intervening ten or fifteen years," Mr. Burns said, "the World War made a fundamental change in price levels so that Cities Service Company's pre-war cost was not comparable to value prevailing in 1924." Mr. Ogle also testified that Cities Service Power & Light Company acquired the entire common capital stock, exclusive of director shares, of the Bartlesville Gas & Electric Company of Bartlesville, Okla., at an aggregate par value of $443,550. In 1928, he said, the electric properties of the company were sold to the Southwestern Gas & Electric Company for $2,062,366. Mr. Ogle stated that the profits of $1,329,365 which accrued to Cities Service Power & Light Company were not recorded as a capital gain and, therefore, were not subject to federal income tax. Mr. Burns denied that there had been any intent on the part of his company to evade income taxes.

In its annual report for the fiscal year 1934, made public last week, the Federal Trade Commission announced that from the beginning of the utility inquiry down to June 30, 1934, power and gas utility holding and operating companies having total assets of $9,930,000,000 have been investigated.

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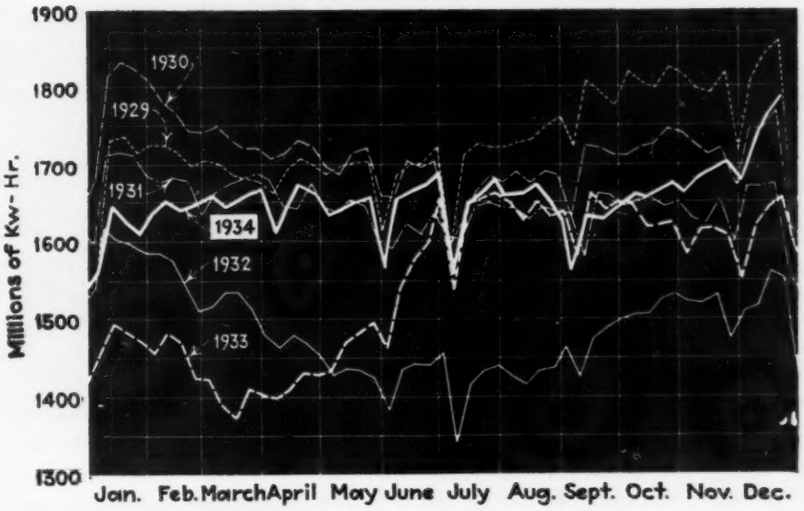
Bardo Replies to Critics of Business Recovery Plan

Maintaining that most of the criticism of the program formulated by the Joint Conference of Business Men meeting recently at White Sulphur Springs, W. Va., was leveled at provisions which it did not contain, C. L. Bardo, president of the National Association of Manufacturers, expressed confidence that President Roosevelt eventually will be found in a receptive mood toward the business men's suggestions. Mr. Bardo in his statement denied that the "dole" was recommended by the business men in their plan and emphasized that "rewarded work" was recommended. "Obviously," Mr. Bardo said, "those who accuse business men of not recognizing the necessity of dealing sympathetically with the unemployed spoke without reading that which they criticised . . ."

Representatives of the Roosevelt Administration were not favorably impressed by the business recovery plan. Harry L. Hopkins, Federal Relief Administrator, caustically denounced the findings of the nation's business leaders with respect to relief as "presumptive" and indicative of ignorance and selfishness. Harold L. Ickes, Secretary of the Interior and Public Works Administrator, said the business conference recommendation in favor of curtailing public works as a relief activity did not "appeal" to him. Joseph P. Kennedy, chairman of the Securities Exchange Commission, said he would not consider the proposed modification of the securities act until much more testing. Administration Congressmen termed the conference "astonishing," "reactionary" and "discredited."

Winter Peak Highest Since 1929



More energy was generated in central electric light and power plants during the week ended December 22 than in the peak week of any other winter except 1929. The output was 1,787,936,000 kw.-hr., according to the Edison Electric Institute, or 7.9 per cent greater than in the like week a year ago.

During the past month each week has, on the average, brought an increase of 20,000,000 kw.-hr. over the one before. The rise has been extraordinarily rapid even for this season of the year, indicating heightened industrial activity in addition to the natural increase in the lighting load. In three months the rate of production has increased almost 10 per cent. Every region is now well above last year's levels; the percentages in the three industrial divisions of the northeastern quadrant are especially significant.

Weekly Output, Millions of Kw.-Hr.

1934	1933	1932
Dec. 22...1,788	Dec. 23...1,657	Dec. 24...1,554
Dec. 15...1,767	Dec. 16...1,644	Dec. 17...1,563
Dec. 8...1,743	Dec. 9...1,619	Dec. 10...1,519
Dec. 1...1,684	Dec. 2...1,554	Dec. 3...1,510
Nov. 24...1,705	Nov. 25...1,608	Nov. 26...1,475
Nov. 17...1,691	Nov. 18...1,617	Nov. 19...1,532

Per Cent Change from Previous Year

Region	Week ended Dec. 22	Dec. 15	Dec. 8
New England	+ 5.7	+ 4.1	+ 3.5
Middle Atlantic	+ 6.5	+ 6.2	+ 5.2
Central Industrial	+ 8.7	+ 8.3	+ 7.0
West Central	+ 6.1	+ 5.1	+ 6.2
Southern States	+12.3	+10.0	+13.1
Rocky Mountain	+11.1	+11.1	+13.2
Pacific Coast	+ 4.7	+ 5.4	+ 3.2
United States	+ 7.9	+ 7.5	+ 7.7

New Models for 1935 Announced by Kelvinator

Refinement, rather than radical change, characterizes the line of 1935 domestic refrigerators announced by Kelvinator Corporation. The chief new attraction is in the addition of new interior features and in the incorporating in the smaller models conveniences heretofore reserved for highest-priced merchandise.

The eighteen models are included in four groups, the "K," "P," "D," and "SD" lines. The five "K" cabinets are lacquer-finished and range in capacity from 4.25 to 7.60 cu.ft. Three models—porcelain exteriors—comprise the "P" group, the cabinet capacities of which are 5.41, 6.50 and 7.60 cu.ft. The famous Kelvinator food file is included in the 1935 "D" line, which has four models. Sizes run from 5.13 to 8.73 cu.ft. A sliding "food wheel"—five covered crystal dishes on a revolving tray—is included in three of the most luxurious cabinets in the 1935 line, the "SD"—"Super De Luxe" group. Each of the six cabinets

in this division is equipped with a solid-front, cabinet-wide food file with dairy section, crisper and thrift compartment. Sizes range from 6.58 to 23.32 cu.ft.

•

Central Public Service to Liquidate Debt

Holders of securities of the Central Public Service System have been advised of the formulation of a plan of reorganization which provides for elimination of all debts of the Central Public Service Corporation, the Central Gas & Electric Company, the Southern Cities Utilities Company and the Southern Cities Public Service Company. All the common stock of these companies is owned by the Central Public Service Corporation, with the exception of common shares of Southern Cities Public Service, which are owned by the Central Public Utility Corporation.

Most of the securities held by all four of the debtor companies were received pursuant to an agreement of August 15, 1932, under which operating properties of the debtor companies were sold to the Consolidated Electric & Gas Company in exchange for securities of that company. The present plan is intended to liquidate all their debts and facilitate their own eventual liquidation. A hearing will be held on January 24 on the modifications in the plan. Claims against the four debtor companies may be filed until February 15 and objections to claims until March 15.

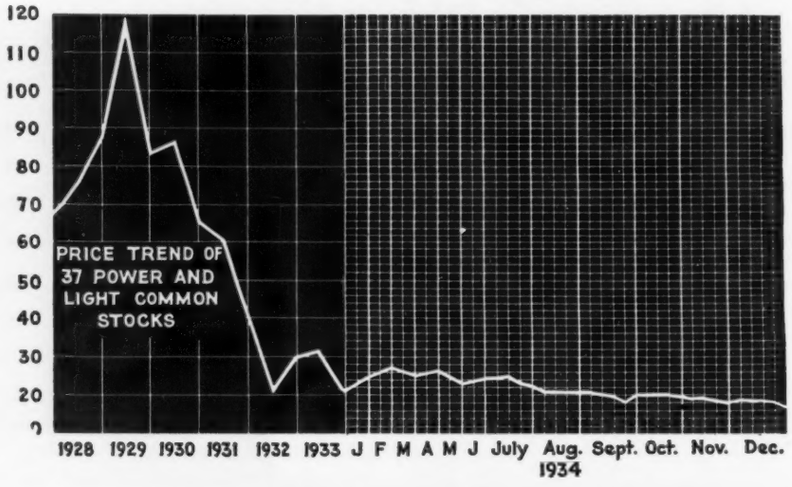
•

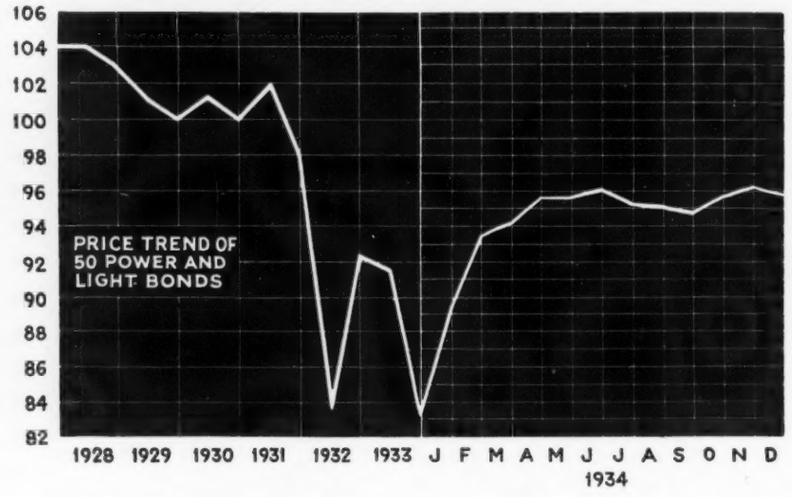
Utility Bondholders Secure, Banking Association States

In its last weekly bulletin the Savings Banks Association of the State of New York stated that "the opinion seems to be that utilities are closer to being legislated out of business than ever before." "Since less than 3 per cent of their assets are invested in utility bonds," the bulletin said, "savings bankers are not as concerned as some others in the continued agitation which is unsettling the market. Not many care to forecast the tenor of Legislatures which begin convening in January. Whatever happens, bondholders will undoubtedly be compensated. Stockholders, evidently, may have to split anything left over.

"Most savings bankers do not venture to guess whether the government is to be a permanent partner in business or is just lending a helping hand," the bulletin continued. However, it remarked that Henry Bruere, president of the Bowery Savings Bank, who spent several months in Washington, D. C., as special adviser to the Administration, believes that the government will remain a factor only so far as it is necessary for it to protect its investments in private enterprises and to represent the interests of the public as the consumer of goods and services.

Stocks Move Narrowly; Bonds Weak





Though stocks moved within a narrow range, slight losses in the utility list were sufficient to carry the "Electrical World" index down to 18.6 from 18.8. Utility bonds were weak in December. "Electrical World" index, 95.9; November, 96.3.

•

Coeur d'Alene Power Plant Restrained by Court

Ruling that Congress has no power to make appropriations for the construction of municipal electric systems which are strictly intrastate in character, and that P.W.A. grants and loans for that purpose are invalid, Federal Judge C. C. Cavanah of the district of Idaho issued a temporary order restraining the city of Cœur d'Alene from borrowing government funds to construct an electric light and power system.

The government had planned to loan and grant the city the sum of $337,000 upon its application following the approval at an election some months ago of an issue of $300,000 in bonds to finance the project. The Washington Water Power Company, which serves the city, assailed the proposed transaction on the grounds that it was a violation of the spirit of the National Industrial Recovery Act, contending the company would lose its property in Cœur d'Alene without due process of law, and the loan of $337,000 was unconstitutional because it was in excess of the amount of the bond issue.

Counsel for the city of Cœur d'Alene has asked for twenty days in which to file an answer to the bill of complaint which seeks a permanent injunction.

New York Metal Prices

	Dec. 19, 1934 Cents per Pound	Jan. 2, 1934 Cents per Pound
Copper, electrolytic	9.00*	9.00*
Lead, Am. S. & R. Price	3.70	3.70
Antimony	13.75	13.625
Nickel ingot	35.00	35.00
Zinc, spot	4.10	4.075
Tin Straits	50.95	50.80
Aluminum, 99 per cent	23.30	23.30

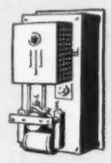
*Blue Eagle.

1934 Brought These Important

NEW G-E DEVELOPMENTS

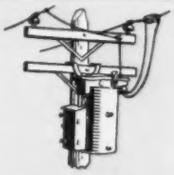
to help you reduce operating costs and improve service

Here are a few of the many G-E developments of 1934 — greatly improved products that you can buy now. They are ready to help you save money — all along the line, from generator to service entrance. Ask your nearest G-E office for further information, or write General Electric, Schenectady, N. Y.

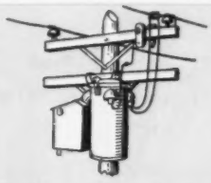


New GENERATOR-VOLTAGE REGULATORS reduce maintenance and improve service

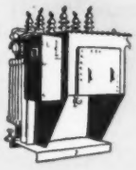
New BRANCH-FEEDER INDUCTION REGULATOR for profitable voltage regulation of 2400- to 6900-volt circuits



New BRANCH-FEEDER STEP REGULATOR for profitable voltage regulation of 2400- to 6900-volt circuits



New BRANCH-FEEDER STEP BOOSTER for profitable voltage regulation of 2400- to 6900-volt circuits

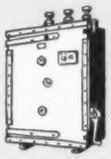


Improved STEP VOLTAGE REGULATOR for higher-voltage circuits

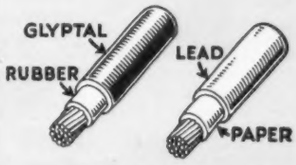
IMPULSE OIL CIRCUIT BREAKER—interrupts in about one-third the rated time of the fastest high-voltage breakers heretofore available

New THYRITE STATION-TYPE LIGHTNING ARRESTERS that give you 30-per-cent better protection than previous designs

TURBINE SUPERVISORY EQUIPMENT—for indicating and recording shaft eccentricity, bearing vibration, shell expansion, and rubbing

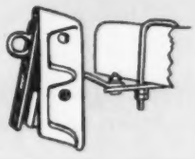


New heavy-duty SECONDARY-NETWORK PROTECTOR — smaller in size — promotes safety, assures better protection, and reduces maintenance



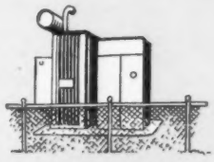
New CABLE FOR SECONDARY NETWORKS — Pyranol paper-insulated, leaded, and Glyptal sheath types

New 2400- and 4800-volt DISTRIBUTION TRANSFORMERS — with Thyrite bushing arresters and isolating gap for self-contained lightning protection

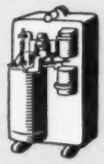


2-IN-1 INDICATING AND DROPOUT FUSE CUTOUT for reducing maintenance

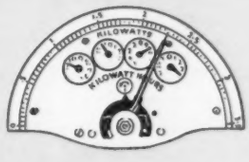
OIL CIRCUIT RECLOSER for better protection of suburban-branch and rural lines; reduces line maintenance and improves customer good will



Modern **UNIT SUBSTATIONS**, metal-enclosed, for radial, primary network, and suburban service



CONTACT-MAKING VOLTMETER of new design with 90 fewer parts than in previous types



TYPE M-20 DEMAND REGISTER and unique checking device for accurate and reliable service

96-113

GENERAL ELECTRIC

Home of Tomorrow Converted into Permanent Institute

Westinghouse closed to the public its now internationally famous Home of Tomorrow at Mansfield, Ohio, last month, pending reopening as a Home Economics Institute, according to A. E. Allen, vice-president. Approximately 75,000 persons, representing some 47 states and 24 foreign countries, have inspected the project since its opening last February. "Converting the Home of Tomorrow into a Home Economics Institute is the perfectly logical and natural step toward making the results of our manufacturing and testing available to the housewife," Mr. Allen stated. "We feel that the Home of Tomorrow Institute will carry on the work our engineers initiated by training and supervising the work of home economists from all parts of the country in the use of electrical appliances." The institute will be opened February 1.

•

N.E.M.A. Forms Sub-Group for Service-Entrance Cable

To facilitate the discussion of technical and engineering details and trade conditions pertaining to service-entrance cable the members of the rubber power cable group of the wire and cable section of the National Electrical Manufacturers' Association requested the forming of a special sub-group to deal with these matters. The members of the wire and cable section recently authorized the forming of the sub-group and the board of governors approved. At an organization meeting officers were elected as follows: Chairman, H. W. Finnell; vice-chairman, J. A. Wahlgren; secretary, J. H. Maxson.

•

Power Companies Back Better Housing Campaign

A rapidly increasing list of power companies are actively cooperating with the national better housing program. Southern California Edison Company is conducting an advertising campaign in 172 newspapers, on billboards and through daily radio programs. Over 500 contractors are being tied in through a series of dinner meetings. Pacific Gas and Electric Company also has an elaborate program in process.

Among other representative utilities which are cooperating with campaigns of their own are Commonwealth and Southern, Electric Bond & Share, the Doherty group, Commonwealth Edison (Chicago), Boston Edison, Public Service of Northern Illinois, Virginia Electric & Power, Union Gas & Electric (Cincinnati), Northern States Power (Minneapolis), West Penn Power (Pittsburgh), Public Service of Denver, Portland General Electric, Oklahoma Gas & Electric, Idaho Power, Public Service of New Jersey, Associated Gas & Electric, American Waterworks group, Stone & Webster, Colorado Gas & Electric and New Orleans Public Service.

•

Britain Extends Grid Plan

General trading under a Grid tariff, in accordance with the provisions of the electricity (supply) act, 1926, began in southwest England and south Wales, according to an announcement made by the British Central Electricity Board on January 1, 1935. The introduction of the Grid tariff in southwest England and south Wales, together with the beginning of general trading in south Scotland, for which a tariff is now in preparation, will result in the Grid network functioning, as contemplated by the 1926 act, in the whole of the country for which the board had adopted schemes, with the exception of northeast England, where a considerable amount of work is still involved in completing the standardization of frequency program.

•

NEWLY LIGHTED AIRPORT

Following the latest American practice for first-class fields, Madrid, Spain, has recently installed new lighting equipment at its national airport. The accompanying illustration is a close-up of a landing projector. Equipment was supplied by the International General Electric Company.

Lighting Commission to Meet in Germany

Announcement has been made by the United States National Committee that the 1935 session of the International Commission on Illumination will be held in Berlin July 2-9. The committee, which recently held its annual meeting in New York, includes among its membership representatives from the American Institute of Electrical Engineers, the Illuminating Engineering Society, the Optical Society of America, American Physical Society and the Bureau of Standards. E. C. Crittenden and G. H. Stickney were re-elected respectively to the offices of president and secretary-treasurer of the United States Committee.

•

St. Lawrence Plan Halted by Province of Ontario

Construction of the proposed deep waterway and power development works in the international section of the St. Lawrence River is definitely postponed by the refusal of the Province of Ontario to participate, it was recently revealed when Premier Hepburn of Ontario positively declared that his province will not implement the agreement negotiated by former Premier Henry with the federal government. This agreement called for a financial contribution exceeding $100,000,000 by the Province of Ontario and the development of hydro-electric power estimated at 1,000,000 hp.

Premier Hepburn pointed out that Ontario has a surplus of hydro-electric power and is paying for power from Beauharnois, Que., for which it has no market. The contract for the purchase of this power was made under the former régime.

•

Mortgage Bonds Called

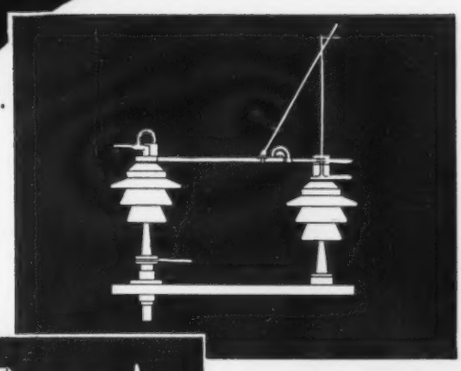
All of its outstanding first-mortgage bonds have been called by the Power Corporation of New York for redemption on January 29. The bonds consist of $4,275,000 of 6½ per cent series A, due November 1, 1942, and $855,000 of 6 per cent series B, due on the same date. The 6½ per cent bonds are to be redeemed at 104 and the 6 per cent bonds at 104½, plus accrued interest to date of redemption.

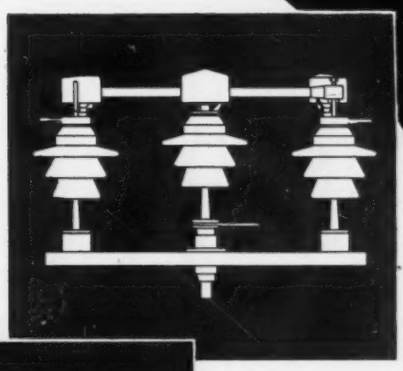
•

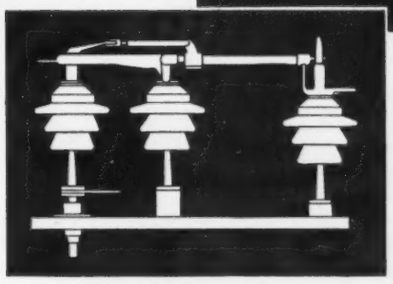
Canadian Output Higher

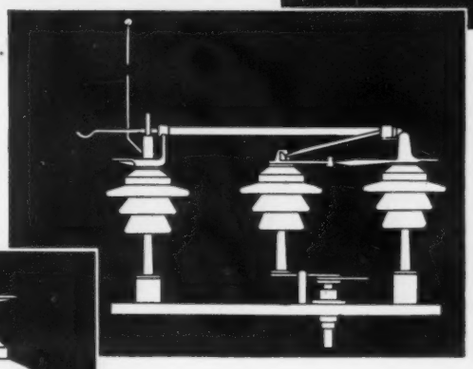
Output of central electric stations in Canada during October amounted to 1,853,388,000 kw.-hr., or a daily average of 59,787,000, it is reported by the Dominion Bureau of Statistics. This figure represented an increase over the September average of 10 per cent, and over the October, 1933, average of 14½ per cent.

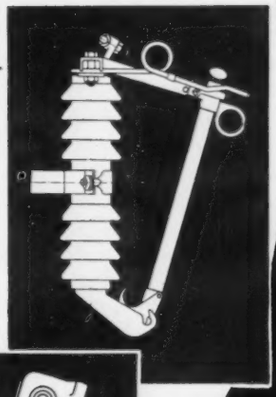
the OUTSTANDING SWITCHGEAR ACHIEVEMENT·

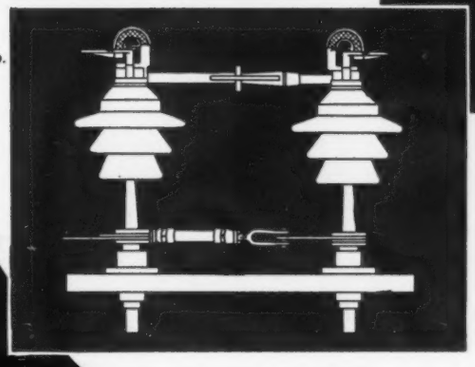




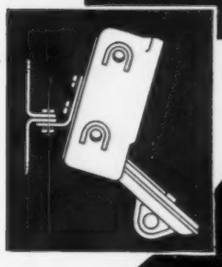








1. Type "AA"—Air Break Switch
2. Type "TTT"—Disconnect Switch
3. Type "TTR"—Disconnect Switch
4. Type "TTL"—Air Break Switch
5. Type "KO"—Knockout Fuse
6. Type "DR"—Disconnect Switch
7. Type "EKO"—Drop Out Fuse



CHARACTERIZE *all* R&IE PRODUCTS *from* DISTRIBUTION

CUTOUTS *to* 220 KV. DISCONNECTING SWITCHES.

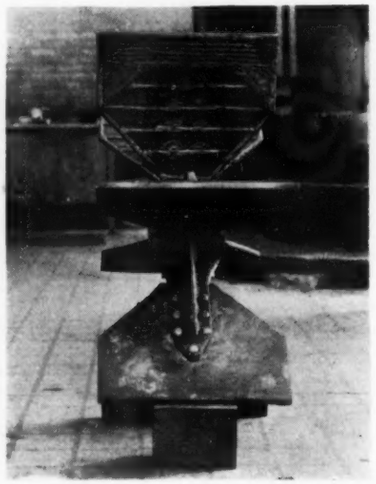
HI-PRESSURE CONTACTS

Increases Life of Exhauster Fans

Wear of the blades of the exhauster fans that take the powdered coal from the mills is a large item in the maintenance of pulverized-fuel firing systems. Powdered coal is a pretty effective abrasive. To keep maintenance costs as low as possible, it is necessary to obtain the maximum wear from each set of exhauster fan blades.

To this end a series of tests were carried out at the Powerton (Ill.) station of the Super-Power Company to determine the blade which would give the most wear for the least cost. Practically all types of hard-surfacing rod for laying on a protective surface by electric welding were tried, as well as blades of different materials and types —alloys and heat-treated steels, rubber-faced blades and serrated blades.

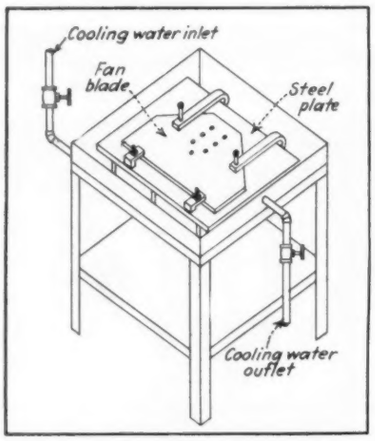
Results of these test showed that by far the cheapest exhauster maintenance was obtained by using a blade sheared out of boiler plate and overlaid with a layer of chilled cast iron. The original blades of unprotected boiler plate averaged 2,600 hours service, while the blades overlaid with the chilled iron averaged 6,000 hours.



Exhauster fan rotor with hard-surfaced blades

The method of applying the iron is simple. The blade is tightly clamped to a flat steel plate to prevent warping during the welding operation. This plate is submerged in a tank through which water is flowing. The water level is held so that the bottom of the blade to be welded is in the water, but the top or welding surface is dry. Cast-iron rod is then applied with the electric arc using reversed polarity and about 300 amp. Depositing this rod on the cold steel blade gives a surface of extremely hard chilled cast iron with very high wear-resisting qualities. The overlay can be puddled in solid over the entire face of blade or the pattern of the overlay can be altered, depending on the wear characteristic of each type of fan.

This overlaying is easy to do. It can be done by ordinary labor and does not require an experienced welder. Blades can be kept uniform by having the welder count the number of sticks of cast iron put on each blade. After the fan rotor is assembled it can be put on the balancing ways and any slight unbalance corrected. Comparing all the various hard-surfacing rods and the prices charged for them with the chilled cast overlay at 6 cents a pound, with a wear equal to any of the high-priced hard-surfacing rods, it is possible to make a considerable saving by this method, it is reported.



For depositing chilled cast iron on fan blades

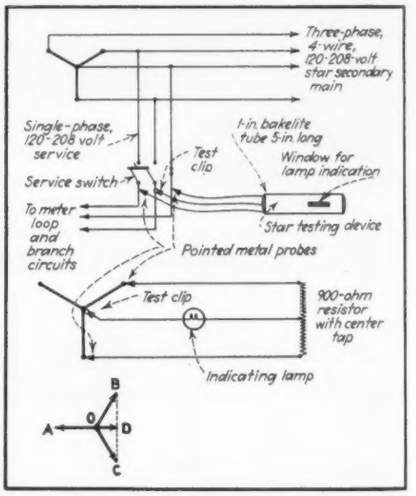
The heat of welding the iron to the surface of the fan blade is rapidly carried off by the heavy steel plate in contact with flowing cold water. The layer of iron on the blade thus becomes almost crystal hard and highly resistant to abrasion.

•

Testing Device Aids Meter Setter

Consumer services are usually supplied either from a 110/220-volt, three-wire delta connection or 120/208-volt, three-wire star connection. As these services are generally identical in appearance, the meter setter must ascertain which connection he is dealing with, as the delta connection requires a single-element meter and the star connection a two-element meter.

To facilitate this the Pacific Gas & Electric Company developed the star-delta testing device shown. The meter setter connects the center clip to a good ground and then touches one of the other leads to the "hot legs" of the service switch. If the lamp lights it shows that the ground connection is good. If no light is obtained it will be necessary to explore until a more satisfactory ground connection is



Star-delta testing device connected to a star service

The vector diagram shows the resultant voltage which lights the lamp on a star-connected service.

Stands the gaff

GLASS LAUGHS AT WEATHER AND TIME

GLASS *offers* PLUS *features*

- No aging or deterioration.
- Unaffected by sudden temperature changes.
- Internal strains and stresses removed.
- Homogeneous in character, only one coefficient of expansion.
- Sustained high dielectric strength.
- Clear and flawless for easy inspection.
- All surfaces are impervious to moisture.
- This tougher, improved glass withstands rough handling.

● Perpetual youth in an insulating material? *Glass* has it! This new, tougher Hemingray Glass is unaffected by the action of the elements. It is homogeneous in character, has only one coefficient of expansion. It is not subject to conflicting strains induced by heat and cold. Hemingray Insulators after 40 years of known service are free from any sign of aging or deterioration. The many superiorities of glass for low cost primary and secondary distribution service are worth knowing—worth investigating. Ratings up to 10,000 volts. Variety of styles in light green and brown colors available. Write for information. Owens-Illinois Glass Company, Hemingray Division, Muncie, Indiana.

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HEMINGRAY *Glass* PIN TYPE INSULATORS

found. With a good ground established, the lamp should light with one exploring lead in contact with one hot leg of the service. Retaining this connection, the other exploring lead is connected to the other hot leg. If the lamp ceases to burn a delta service is indicated, requiring a single-element meter. If the lamp continues to burn, but at a reduced brilliancy, a star service is indicated, requiring a two-element meter. With the star connection a resultant of approximately 30 volts is obtained between the neutral and the center point of the resistor when the two outside leads are across the terminals of the star.

The device may also be used to test three-phase, four-wire services. After the center point has been connected to ground, one exploring lead is connected successively with each of the three other legs. If the brilliancy of the lamp remains the same under each connection the service is a four-wire star connection, requiring a two-element meter. If two points indicate the same amount of light and the third gives a much brighter light, the service is four-wire delta connection.

For a three-wire, direct-current service, the indication of the testing device will be the same as that obtained from the delta service. However, the lamp will burn intensely bright when the device is used on d.c.

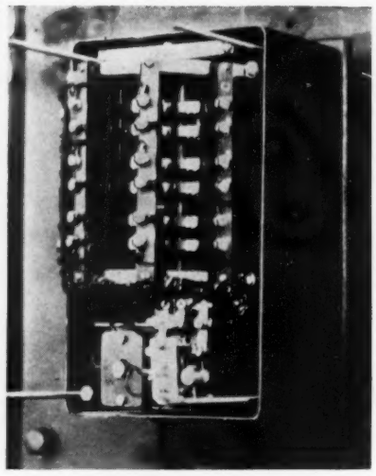
The device is light, simple to operate, conserves the meter setter's time and insures a correct meter installation.

•

Tri-Purpose Substation Control

Loss of one or more sources of supply at Leeds substation (15 miles from the center of Alabama Power Company's 110-kv. network) might seriously affect system operation. Therefore it is essential that any breaker relaying out be closed as quickly as possible in order to maintain the proper loading on all lines, or, in case of feeder trouble, to restore service to the customer. With this in mind, an automatic control scheme was devised by J. N. Stewart of the operating department. It performs the following functions:

1. Checks synchronism and closes any 110-kv. breaker that has opened automatically so the line is energized within one-half minute.
2. Closes all 44-kv. feeders which have opened automatically on a 0-½-2-minute cycle and then locks them out.
3. Checks synchronism and immediately closes the breaker on the 44-kv. tie line to Jackson Shoals if an in-phase condition exists.



Master selector closes eight breakers in sequence

It was imperative that a closing scheme for the eight 110-kv. breakers be adopted which would make it physically impossible to restore service on more than one line at a time, due to the heavy duty imposed on the station battery. A master selector relay provides positive interlock features and makes a monetary saving due to the reduction of the number of auxiliary devices which would have otherwise been necessary. It consists of a motor-driven drum with three contacts. Surrounding this drum are eight insulated spring contacts that bear on the moving contacts when the drum revolves. Each post represents an individual breaker and only one post may make connection with the drum at a given time.

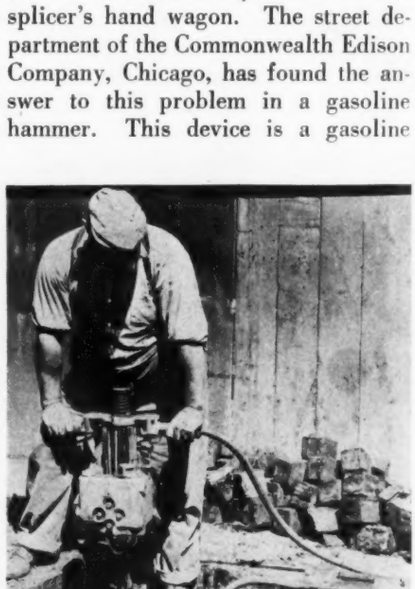
When a 110-kv. breaker opens, a relay across the green light supplies 125 volts d.c. from the station battery to start the selector rotating. If the line has been re-energized when the drum contacts pass under the spring contacts controlling the open breaker the selector will stop rotating. At this point necessary circuits have been set up by which synchronism may be checked, and if the line is shown to be in phase the breaker is closed. If the line is not in synchronism the selector holds its position until an in-phase condition occurs, when the breaker will close. Should the line not be energized when the drum passes under its post the selector will continue to rotate until the line has been charged or until the automatic feature of the breaker has been removed manually.

It is now possible at Leeds to change from a manually operated station to one having complete automatic features by the mere closing of a few knife switches.

Gasoline Hammer Proves Handy Tool

For opening the pavement for a conduit run or other large job the air hammer, as a concrete breaker or asphalt cutter, has the field pretty much to itself. But when it is necessary to peck only an occasional hole in the street (for instance, to repair a burned section of Edison tube) it is hardly worth while to drag around a heavy air compressor with its gasoline-engine drive, in one company's opinion. Such an outfit runs into money and it takes quite a lot of sledge and pick-axe work to compare with it in cost. Neither is an electric hammer so good for such jobs, because the workman out in the middle of a street cannot always be sure of finding an electrical connection.

What is needed is a good, husky power hammer that will require neither a power connection nor a lot of auxiliary equipment to be dragged around with it, preferably a tool that can be carried easily in the cable splicer's hand wagon. The street department of the Commonwealth Edison Company, Chicago, has found the answer to this problem in a gasoline hammer. This device is a gasoline



Gasoline hammer at work

motor that never grew up; that is, it lacks crank, flywheel and all rotating parts, and consists simply of a single cylinder in which a spring is compressed when the piston responds to the gas explosion. These hammers are used not only for opening pavement in underground system work but by the overhead men for breaking concrete around poles in paved alleys.

Resuming Construction

[*Continued from page 52*]

generating equipment retired during the year, conducted by the ELECTRICAL WORLD for the first time, gives a list of about 354,000 kw., leaving a net decrease of 260,000 kw. The U. S. Geological Survey shows a decrease of 200,000 kw. The two are in essential accord; the difference can be accounted for by the way of counting changes just at the turn of the year. The slight decrease of 1933 developed into a larger one in 1934—doubtless the first time in the history of the industry that there has been a diminution in aggregate rating. In 1935 additions will probably exceed retirements.

Federal and Non-Federal Public Works

Initial Capacity	Kw.
Boulder Canyon (1936)	300,000
Grand Coulee (1938)	84,000
Casper-Alcova (1938)	20,000
Bonneville (1937)	86,000
Fort Peck (1939)	50,000
Platte River	25,000
Loup River	44,000
Saluda River	.....
Pecos River	3,250
Colorado River (Texas)	20,000
Tennessee Valley	425,000

Capacity Retired During 1934

(Minor changes omitted)

Public Utility Plants

Company	Kw.
Abington Elec., Clarks Summit, Pa.	500
Arkansas Power & Light	1,764
Baton Rouge Electric	1,500
Central Illinois Light	5,000
Commonwealth Edison (end 1933)	144,000
Commonwealth Edison (end 1934)	72,000
Connecticut Power	600
Detroit Edison (net decrease)	77,110
Delaware Power & Light	2,000
El Paso Electric	4,000
Iowa Electric Light & Power	500
(Scheduled for 1935)	1,600
Louisiana Power & Light	752
New Orleans Pub. Service, Inc.	1,200
Northern Indiana Power	950
Pacific Gas & Electric	8,650
Public Service of Northern Ill.	12,000
Puget Sound Power & Light	1,000
Virginia Electric & Power	832
Westchester Lighting	10,550

Municipal Plants

City	Kw.
Austin, Minn.	750
Columbia City, Ind.	400
Independence, Mo.	1,000
Richmond, Ind.	3,000
Taunton, Mass.	800
Troy, Ohio	1,250

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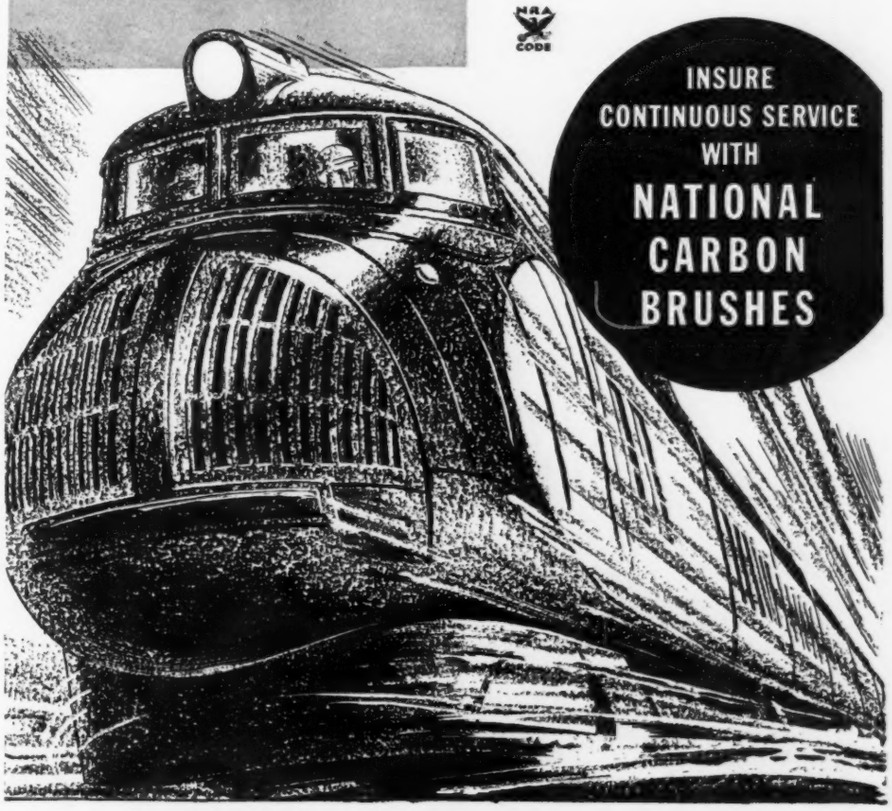

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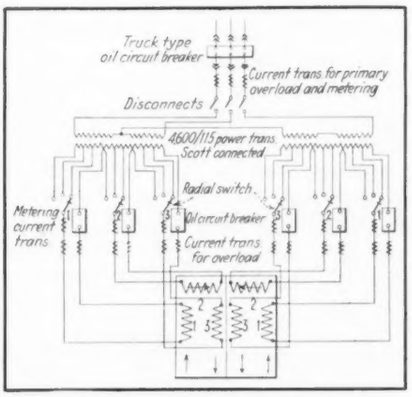
Anneals Sheet Brass in Electric Furnace

By G. E. WHITTAKER
Chase Brass & Copper Company, Cleveland

A new electric furnace for annealing sheet brass has just recently been installed in the Cleveland plant of the Chase Brass & Copper Company. Actually it consists of two separate furnaces, exactly alike, inclosed by a common shell and separated by a dividing wall. Each furnace has its own heating elements and operating mechanisms. The furnaces are of the pusher, recuperative type and are loaded and discharged through the same doors. Each has three pushers with the following cycle of operation: (1) Push-out, (2) push-across, (3) push-in. The cold incoming work travels alongside the hot outcoming work and in that manner is preheated.

Each furnace has three temperature zones, having different maximum power inputs, which are varied inversely from the first to the third zones. Different ratings are obtained by a hand-operated radial switch which changes the tap connections.

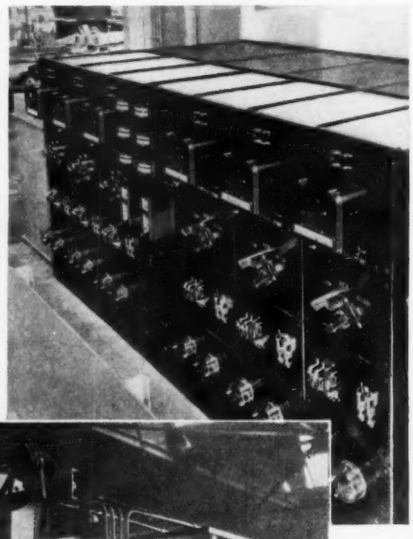
Temperature in each zone is governed by a potentiometer-indicating controller which controls an oil breaker in one leg of each circuit, the other leg being carried through the radial hand-operated switch. Because the control circuit for the oil breaker is carried through an auxiliary contact on the radial switch it is possible to isolate completely any zone by opening it. The overload protection for each zone was described in the September 15 issue of ELECTRICAL WORLD. A current transformer of larger capacity than the two used for overload protection is installed in each zone to operate an ammeter.

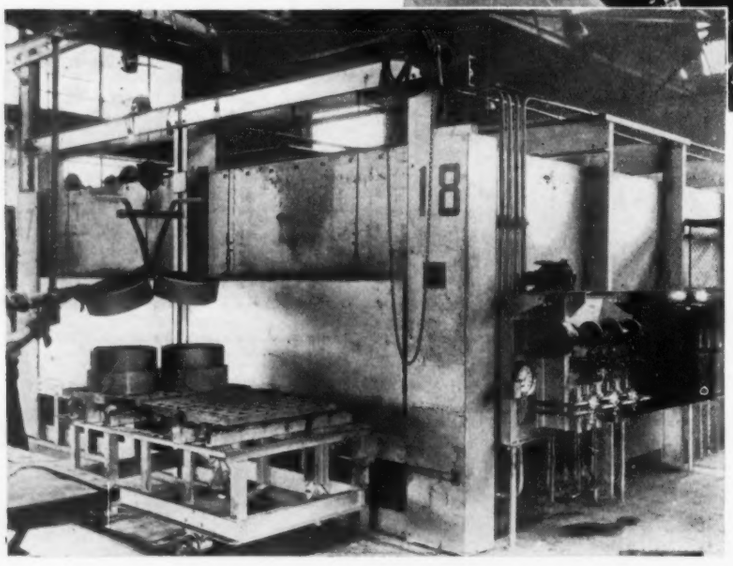


Feed and control for dual furnace

Pusher control for each furnace is completely automatic, being controlled by a time switch, which can be set for any interval desired. The pushers are hydraulically operated and the pump and the sequence of operations of the pushers are controlled by motor-driven cams and a series of track-limit switches.

Two watt-hour meters, installed on each furnace, measure separately the amount of energy used for heating and for control.





Sheet-brass annealing furnace and control

A single-phase, air-cooled transformer feeds each furnace. Both are Scott-connected to a three-phase, 4,600-volt line with disconnecting switches at the furnace end. The oil switch in the substation at the other end of the line can be operated from the furnace-control board. The transformers have nine taps on the low-voltage side, thereby permitting three rates of input to each zone.

•

Individual Drives Aid Food Processing

By H. L. KIMBALL
Superintendent of Production
Tea Garden Products Company,
San Francisco, Cal.

Individual induction motor drives are most satisfactory for maintaining production under sanitary conditions in the processing of preserves, mincemeat, syrups and other edibles which must be put through the factory in good volume and under conditions of maximum operating safety. Our experience has shown that with well-made processing equipment and suitable motors the machines will last indefinitely if consistently maintained. In the accompanying illustration a filling machine with a capacity of 1,800 jars per hour is shown at the rear left, with

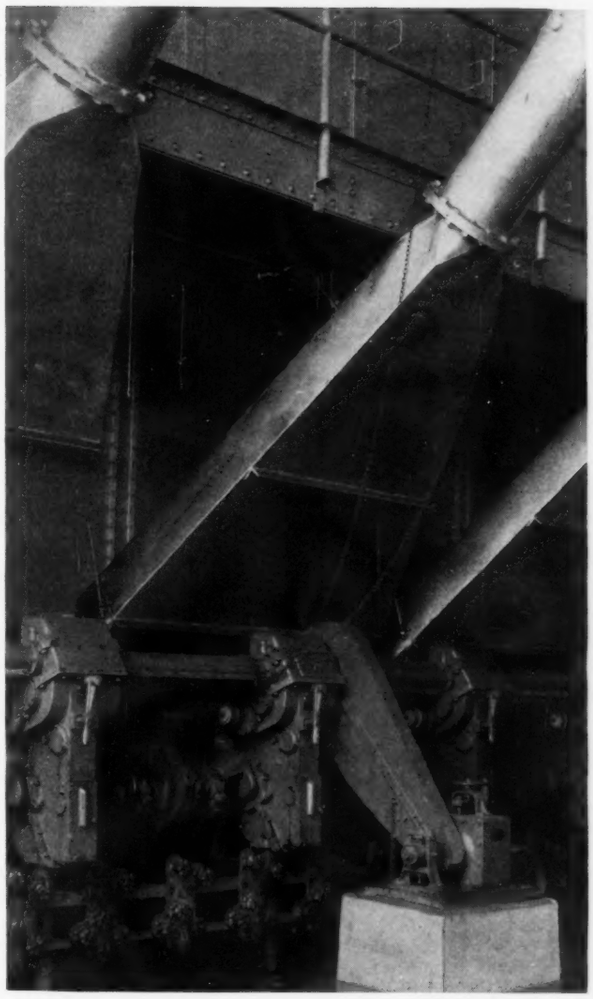
FRONT-OF-STOKER Control with the C-E MULTIPLE RETORT STOKER

The operator can control from the front of the stoker the length of stroke of all the distributing (secondary) rams, each group of rams, or individual rams, as desired; also the stroke of any group of moving grate bars (alternating with fixed bars) in the overfeed area at the lower end of the retorts. The latter feature aids in preventing accumulations of slag and clinker, and facilitates maintenance of proper contour of fuel bed at this very important point. The operator can control the speed of all the rams simultaneously by changing the speed of the main drive, or he can start, stop or change the speed of any group of rams, from the front of the stoker.

Moreover, he can make all of these operating adjustments while the stoker is in motion. It is unnecessary to shut down the stoker or have access to any interior part.

By means of these C-E MULTIPLE RETORT STOKER features the operator is enabled to control promptly and accurately the supply and distribution of fuel and air throughout the entire grate area, as required to meet varying conditions of load and fuel.

The result is more flexible and efficient operation.



Partial front view of one of the six C-E Multiple Retort Stokers in the new U. S. Central Heating Plant, Washington, D. C.

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MANUFACTURING DIVISIONS: The Hedges-Walsh-Weidner Company, Chattanooga, Tenn.; Coshocton Iron Company, Monongahela, Pa.; Raymond Brothers Impact Pulverizer Company, Chicago, Illinois; Heine Boiler Company, St. Louis, Mo.

A-211

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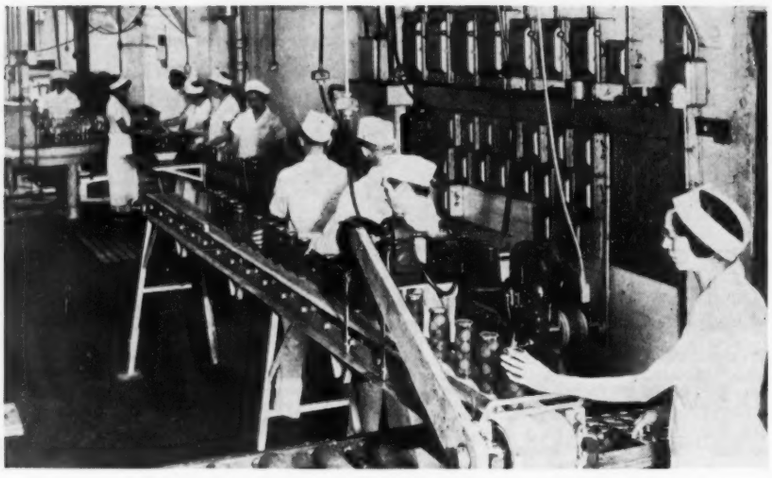

Motors mounted out of way in production line
drive food-processing machinery steadily and without impairing quality of material handled in factory where clean operation is essential.

a capping machine of the same capacity at the right center. The absence of overhead belts and compactness of the motors required makes the electrical installation unobtrusive, free from space occupancy of value for other uses, without hazards to operators and still extremely accessible for inspection and repairs.

The filling machine is driven by a ½-hp. General Electric motor of 1,800 r.p.m., the main shaft of the filler being run at 350 revolutions through reduction gear and belt. Any speed changes required at the machine are effected by pulley shifting. Across-the-line starting is provided by a snap switch and the production line is arranged for direct sequence from the filler to the capping machine at the right. The latter is served by endless belts which transport the jars from the receiving point at the lower end to the capping position, and thence to the packer in the foreground. Another ½-hp. motor (1,130 r.p.m.) drives the capping outfit through gearing which rotates the main shaft of the machine at 160 r.p.m. The filling machine was manufactured by Karl Kiefer, Cincinnati, Ohio, and the capper by the Phoenix Metal Cap Company, Chicago. The plant also contains a labeling machine designed by the Economic Machinery Company, Worcester, Mass., and having a capacity of 900 to 1,800 jars per hour, also driven by a ½-hp. induction motor with speed reduction from 1,800 to 32 r.p.m. for machine shaft driving.

•

Analysis of Industrial Loads

The results of last year's power usage in about 50 manufacturing and mercantile establishments embracing some 30 different kinds of service have been investigated from the standpoints of demand, energy usage, average price of energy and load factors. The demands tabulated and used in figuring annual load factors were those of December, 1933. The results apply to industries in a specific region on the Atlantic seaboard and indicate, in a measure, the character of different classes of power usage among the 50 installations listed, under the conditions prevailing last year. Energy from both steam and hydro plants was used by these customers. It is noteworthy that from the viewpoint of load factor hotels, bakery service, newspapers, paper and large rubber mills rang very high.

Maximum Demand, Consumption, Average Energy Price and Annual Load Factor of 50 Installations

Type of Industry	Max. December Demand (Kw.)	Energy Consumed in One Year (Kw.-Hr.)	Average Price per Kw.-Hr. Cents	Annual Load Factor %
Apartment hotel	149	825,840	1.82	63.2
Bakery	105	426,400	1.87	46.4
Brake lining maker	259	698,800	1.95	30.8
Brick maker	123	16,600	7.50	1.5
Car wheel maker	184	268,800	2.91	16.7
Coffee processor	144	188,000	3.36	14.9
Confectionery maker	488	1,117,200	2.00	26.1
Conveying equipment maker	89	92,400	4.59	11.8
Cutlery maker	1,378	2,309,217	1.63	16.7
Department store	615	1,581,600	1.80	29.4
Department store	1,786	5,413,600	1.76	34.6
Farms (2,032 served)	....	1,425,582	4.64	....
Foundry	71	86,000	4.55	13.8
Foundry	588	1,323,600	1.75	25.8
Hospital	330	1,477,232	1.82	51.1
Hotel	185	937,112	1.87	57.8
Hotel	212	1,084,100	1.78	58.4
Hotel	240	1,147,870	1.80	54.5
House furnisher	132	277,374	3.43	24.0
Machinery maker	149	261,200	2.61	20.0
Machinery maker	152	224,200	2.85	16.8
Machinery maker	156	206,400	3.29	15.1
Meat packer	195	612,200	1.84	35.8
Mental hospital	372	1,613,000	1.79	49.5
Newspaper	515	1,642,046	1.92	36.4
Newspaper	672	2,595,180	1.85	44.1
Newspaper	691	2,821,626	1.74	46.6
Office building	445	1,026,412	2.70	26.3
Paper mill	1,043	3,504,000	1.26	38.3
Paper mill	1,130	4,317,600	1.23	43.6
Printing plant	120	118,400	4.50	11.3
Provision store	113	475,200	1.69	48.0
Radio broadcasting station	267	1,064,000	1.41	45.5
Railroad shop	312	795,100	1.96	29.1
Rock crushing plant	353	165,800	4.80	5.3
Rubber manufacturer	291	905,800	1.77	35.6
Rubber manufacturer	500	999,400	2.01	22.8
Rubber manufacturer	691	2,867,884	1.47	47.3
Rubber mill	1,535	5,514,000	1.17	41.0
Rubber mill	5,663	22,056,000	1.04	44.5
Signal apparatus maker	84	100,400	4.27	13.6
Signal apparatus and motor maker	203	305,780	2.88	17.1
Silk manufacturer	342	745,200	2.37	24.9
Steel pipe maker	900	2,321,400	1.41	29.5
Stone crushing plant	352	300,800	3.81	9.7
Tannery	224	560,800	2.01	28.6
Tannery	260	432,000	2.38	18.9
Thread mill	117	183,400	3.22	17.9
Thread mill	900	1,043,800	1.34	13.3
Wire mill	412	1,596,200	1.44	44.3

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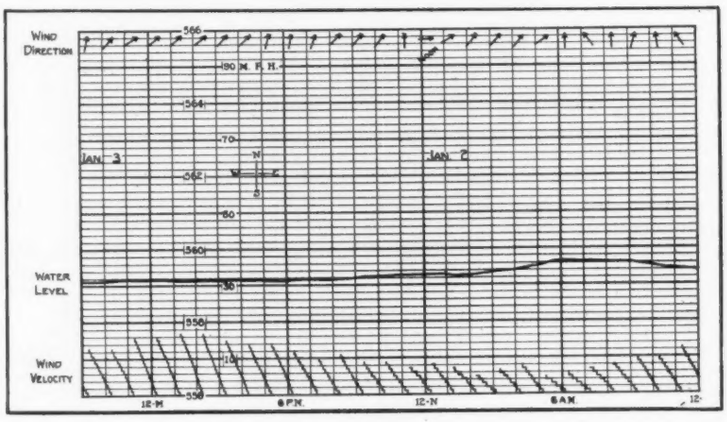
Wind and Water Level on One Meter Record

Operation of the Schoellkopf and Adams stations of the Niagara Falls Power Company hinge to some extent upon wind and water conditions at Lake Erie and the Niagara River. Therefore a continuous record is desired of wind direction, wind velocity and water level. Up to a few years ago these observations were separately recorded by three independent instruments. Now they are recorded on a single chart by a special instrument designed for the purpose.

Direction and velocity of the wind have an important effect upon the Lake Erie level at the head of the Niagara River and, consequently, affect the flow of the river and the associated water levels all along the shore. A sustained northeast wind causes a low flow and a sustained southwest wind causes a high flow and the water surface elevations change accordingly. Plant capacities are modified to some extent by the change in head at the falls and the operations at the intake structures are affected. In the winter time, for instance, a knowledge of the wind's direction and velocity is valuable in determining the schedule of operations for the tugs used to prevent ice from choking the channels near the ice booms.

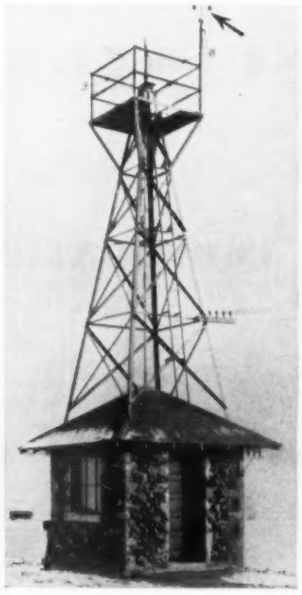
The wind gage station is located in the Upper Niagara River on Grass Island, where the absence of any structures makes this location an ideal one.

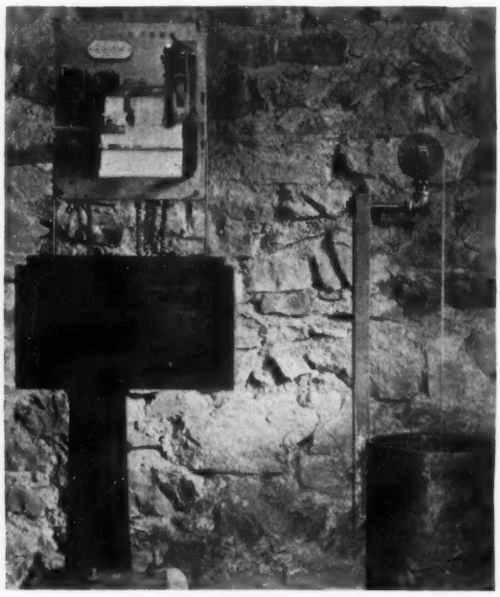
The gage was designed and perfected by P. Sailer of the meter department of the Niagara Falls Power Company.



Record made at sixteen-minute intervals

Two inches of paper represents a six-hour run, or one small division on the chart represents one hour. At 12 o'clock each day "noon" is automatically stamped on the chart. A record on the bottom of the chart represents the amount of wind travel each hour, each major division being 10 miles. The distance the wind travels is integrated for the period of one hour, the pen being "notched up" every mile of travel. At the end of each hour period the pen is reset at zero and starts to integrate another hour's run. The distance traveled in one hour is given by the high points of the record and, therefore, these points represent the average velocity of the wind for one hour.





Meter graphs wind values and water level

Left—30-ft. steel tower carries the anemometer cups and the direction arrow to an elevation where the wind has free play. Right—Miniature steel arrow stamps the chart through a typewriter ribbon and shows to which point of the compass the weather vane faces. The instrument also carries two pens, one for integrating the wind travel for each hour, the other for recording water level in the river at the site of the gage.

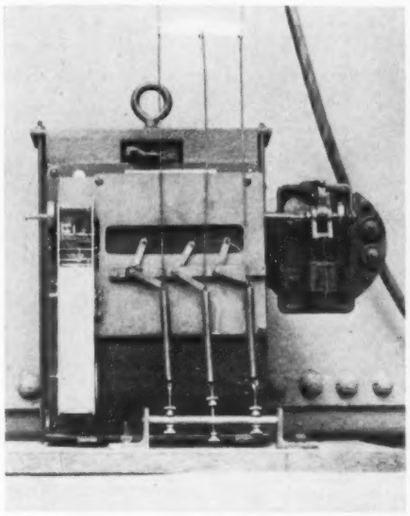
•

Voltmeter Adapted to Vibration Studies

In order to obtain factual data on conductor vibrations the engineers of the Pacific Gas & Electric Company devised a simple but effective recorder. As shown in the accompanying illustration, a plate upon which were mounted three pivoted styluses was attached to the front of the meter. Wires connected the lever arm of each stylus to a yoke, from the ends of which strings extended to the conductor. The strings were fastened on each side of the conductor clamps so that simultaneous vibration of either span was transmitted to the yoke and

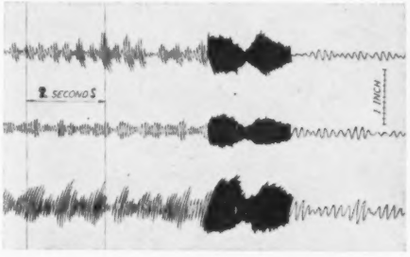
thence to the stylus. With this arrangement the vibration in either span was recorded by the corresponding stylus on the meter, the center stylus recording half the algebraic resultant of the vibration in both spans.

A normal chart speed was maintained by the clock mechanism of the voltmeter, but every 30 minutes the motor-driven mechanism, mounted on the right of the meter, released the chart from the clock mechanism and



Vibration recorder constructed from a standard voltmeter

Strings from either side of the conductor clamps terminate at either end of the metal yoke which actuates the three styluses mounted on the front of the meter. The device on the right is the high-speed mechanism which periodically increases the speed of the chart so as to record frequency as well as amplitude of the vibration.



Section of chart taken from the recorder

Showing how the high-speed chart drive expands the record for easy analysis.

increased the chart speed to an inch per second for twelve seconds and then returned the drive to the clock mechanism. At normal speed the device records magnitude of the vibration and at the high chart speed it is possible to obtain both magnitude and frequency, as is shown in the accompanying reproduction of a section of the chart.

Weyerhaeuser

GROWS the Timber

and *Weyerhaeuser*

Makes the Poles

● Thousands of acres of prime virgin timber are owned by Weyerhaeuser. From these timberlands the finest Red Cedars are marked and cut for manufacture into Weyerhaeuser poles.

This cutting is done with watchful care, not only to select the best, but to protect young trees and allow them to grow straight and strong. Weyerhaeuser methods of selective foresting insure a constant and everlasting supply of superior timber.

How Weyerhaeuser poles are cut, seasoned and processed is a story interesting and vital to buyers of poles. A booklet describing the methods in detail will be mailed free on your request.

POLE AND PILING DIVISION

Weyerhaeuser Sales Company

Executive Offices

FIRST NATIONAL BANK BUILDING, SAINT PAUL MINNESOTA

Branch Offices

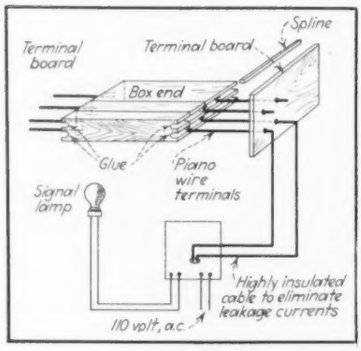
Tacoma Building, Tacoma, Washington
P. O. Drawer 629, Newark, New Jersey
1024 Old National Bank Building, Spokane, Washington

ALSO REPRESENTED BY WESTINGHOUSE ELECTRIC SUPPLY CO.
Detroit Chicago St. Louis

Relay Glue Detector Aids Box Making

By L. O. B. LINDSTROM
General Electric Company,
San Francisco, Calif.

At the plant of the Fruit Growers Supply Company, San Francisco, Calif., an ingenious relay has been installed to insure a uniform quality of the boxes manufactured for the citrus industry. Box ends are fabricated on a high-speed splining machine which cuts two parallel grooves in each trimmed end. Four nozzles feed glue into the grooves and finally a spline is driven into each groove to bond the pieces of board together to form a strong unit.



Relays signal faulty flow of glue

One relay for each of four grooves splined by machine. The alarm lamps are mounted directly over the machine and the relays are mounted on a column.

If the glue should be improperly or inadequately supplied, an inferior product results. To obviate this an electronic glue detector was developed which is an adaptation of the standard General Electric Company's photo-electronic relay. It consists of two textolite terminal boards, each having four piano wire terminals, and a relay for each pair of terminals. Each of the four pairs of wires drags in a different groove, the terminals in each groove being separated by approximately two inches.

Low voltage, low current is supplied from the photo-electric relay in which a two-contact plug has replaced the photo-electric cell here omitted. Contacts in the receptacle are connected with the piano wire terminals through (neon sign) cable, heavily insulated to prevent leakage of the exceedingly small current necessary to operate the device. The glue in the groove completes the circuit. The resulting current is amplified in the amplifier tube of the relay assembly, the tube in turn energizing a small relay having both a normally closed and normally open set of contacts.

If for any reason the glue stops the circuit is interrupted, thus operating the relay and lighting a signal lamp. The machine has speeded production and improved the quality of the product with but a nominal investment.

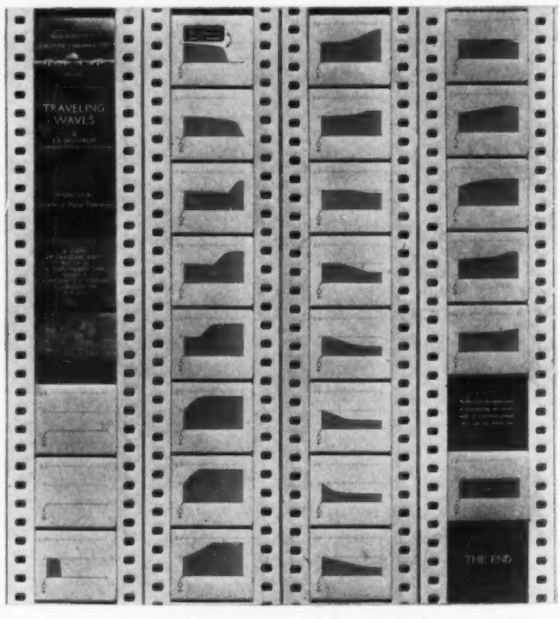
•

Film Explains Traveling Waves

By L. F. WOODRUFF
Massachusetts Institute of Technology,
Cambridge

In spite of intensive analytical effort put on the subject our best manageable analysis of a traveling wave still fails to include skin effect which must have a considerable influence near a steep wave front. The incomplete theory indicates that the initially vertical front will remain vertical indefinitely. An actual wave becomes rounded and sloping in propagation and reflection. This is shown by means of an educational animated film developed at M.I.T. for both class instruction and general circulation. Selected views are shown in the accompanying illustration.

Continuous records were made of the time variation of the voltage at a large number of points on a laboratory line having distributed resistance, inductance and capacitance. A cathode-ray oscillograph was used in conjunction with a commutator device to record several curves simultaneously. Voltage distribution curves at successive instants were reconstructed and tinted paper cut-outs made to match the curves, which were then pasted on white paper with punched holes for exact registration. The film was exposed on an "animation stand" comprising a camera focussed vertically on a platen with registration pins. A transparent celluloid sheet with the line, generator symbol, etc., on it was photographed over the curve.



Sloping of wave-front traced

Every opening and closing of a switch, even turning on a lamp, sets up waves differing only in degree on a power circuit from that here pictured for a laboratory line.

•

Tower Savings by Smaller Footings

In a new tower line described to the Wisconsin Utilities Association by E. W. Hatz of the Milwaukee Electric Railway & Light Company tangent towers and those at small angles are set on steel footings, while the heavier towers at dead-ends and larger angles are set on concrete footings. The dead-end tower used at angles of 90 deg. has two footings 11 ft. in depth in tension, while the two in compression are only 6 ft. in depth, with a resultant saving of more than $250 per tower.

The conductor on this line consists of nineteen-strand, 300,000-circ.mil, hard-drawn copper, 0.630 in. in diameter. It has a carrying capacity of more than 100,000 kva. and the ultimate plan provides that each outgoing line shall be of such size as will carry the output of one generator. There will be no corona loss except for a few days each year when the conditions are favorable for corona formation. The line will be protected by two $\frac{3}{8}$-in. Copperweld ground wires, having an ultimate strength of approximately 14,000 lb., which is equal to that of the conductors.

Reclosing! • Adjustable Time Delay!

RECLOSES the circuit automatically.

A built-in time delay device can easily be adjusted to cut in the following fuse instantaneously or after any interval up to two seconds.

All cartridges are in the up or closed position when the fuse links are intact. A blown fuse can be located immediately.

Rugged, dependable construction. Foolproof time delay device.

Available for 100 amperes capacity, in two- and three-unit designs, for voltage ratings up to 15,000 volts.

See a sample—a demonstration.

LINE MATERIAL CO

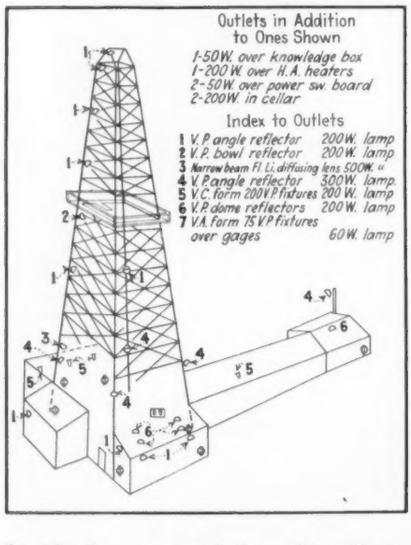
SOUTH MILWAUKEE, WISCONSIN, U. S. A.

BUILDING UP THE LOAD

APPLIANCES, LIGHTING AND POWER • DOMESTIC • COMMERCIAL • INDUSTRIAL

Standard Blueprint Aids Lighting Sales

In selling an intangible quality, such as lighting, the salesman often is confronted with the difficulty of making his prospect see exactly what he is buying. Realizing this, the commercial department of the San Joaquin Light & Power Corporation, Fresno, Calif., has adopted a standard recommendation for oil rig lighting. This recommendation not only describes the equipment necessary to produce adequate illumination for night operations, but sets forth these recommendations by illustrating the oil rig itself and the places where lighting units should be installed.


Outlets in Addition to Ones Shown
1-50W. over knowledge box
1-200W. over H.A. heaters
2-50W. over power sw. board
2-200W. in cellar
Index to Outlets
1 V.P. angle reflector 200W. lamp
2 V.P. bowl reflector 200W. lamp
3 Narrow beam Fl. Li. diffusing lens 500W. "
4 V.P. angle reflector 300W. lamp
5 V.C. form 200 V.P. fixtures 200 W. lamp
6 V.P. dome reflectors 200 W. lamp
7 V.A. form 75 V.P. fixtures over gages 60 W. lamp

Standard recommendations for oil rig lighting

Show not only the type and wattage of each unit but the recommended location for best illumination of the drilling and pumping operations.

On one blueprinted sheet the salesman has all the information necessary for a dramatic, attention-getting sales talk to the oil rig operator who is a prospect for better illumination. Using the illustration, he can show the operator what size and type of unit is recommended at each of the points around the rig where illumination is needed. The idea of pictorializing the lighting recommendation has proved a very valuable sales tool for increasing lighting revenue.

•

Spotting the Range Load

By W. C. MAINWARING
British Columbia Electric Railway Company, Ltd., Vancouver, B. C.

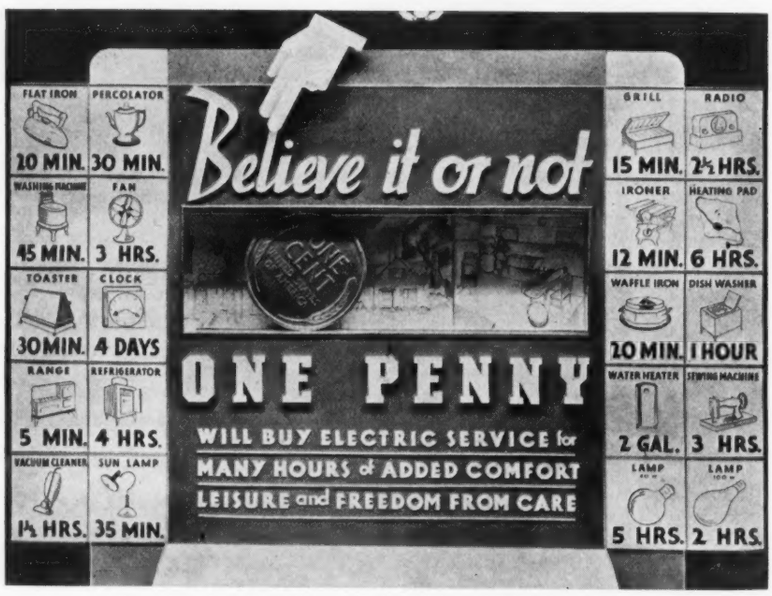
In high saturations, such as that of the Pacific Northwest, analysis seems to indicate that non-acceptance of electric cooking is not the reason why ranges are not selling in the same volume as they were in the late '20s. In reaching a saturation of 30 per cent a large percentage of the consumers in the higher income brackets have been sold and the slowing up of sales is due to the fact that the problem of installing ranges in a manner to suit the purse of consumers in the lower income groups has not been solved. This group of users could afford the service, but cannot afford the purchase and installation of a range within the conventional twelve to eighteen months period that is usually allowed by most dealers and utilities.

Our company finds the following conditions among electric range customers by income groups:

Income Group	Monthly Income When Employed	Per Cent Having Electric Ranges	No. of Families by Income Groups
A	Exceeding $350	97	1,905
B	$250 to $349	53	2,709
C	$200 to $249	24	7,604
D	$150 to $199	9	19,084
E	$100 to $149	4	34,197
F	Under $100	1	9,466

A and B represents 6 per cent of

Selling the Cheapness of Electricity



This animated window display is a new version of the what-1-cent-will-do theme. The hand moves and the penny rolls from side to side. It has attracted much attention in the window of the Rochester Gas & Electric Corporation. It was supported by a general distribution of two leaflets to every domestic customer. Both present the low cost of electric service and the fact that the more you use the cheaper it becomes.

1935 A LOAD BUILDING YEAR

Hotpoint Offers You a Plan for Continuous Year-'Round Load Building in 1935

Hotpoint's comprehensive plan answers your need for adding profitable revenue progressively and continuously. Every utility man realizes that the electric range and water heater head the list for quick and profitable load building. The range alone adds 1200 to 1700 K.W. H. annually—the water heater from 2000 to 4000 K.W. H.—and the two together from 3200 to 5700 K.W. H.

Inspect the completeness of the program, direct factory sales assistance, sales contests, advertising, sales promotion material, sales training, etc.

Look over the Hotpoint Plan. Learn how Hotpoint's experienced and capable District Managers, Range Specialists, Home Economists and Service Men are ready to help you in every way to increase your 1935 range business.

The Hotpoint District representative in your territory will gladly present the 1935 Continuous Load-Building Plan if he has not already done so. Get in touch with him at once, so you may get the story early.

EDISON GENERAL ELECTRIC APPLIANCE CO., Inc.
5618 West Taylor Street, Chicago, Illinois

CALROD . . . *Hotpoint's new Improved Hi-Speed Calrod has set a new standard of performance. It combines unusual speed with remarkable durability. Calrod gives range sales an added impetus.*

ELECTRIC **Hotpoint** RANGES
WATER HEATERS

customers and 70 per cent saturation. A, B and C, representing 15 per cent of consumers, account for a 43 per cent saturation. D and E include 70 per cent of consumers, and have a saturation of 6 per cent. It is in these brackets that a larger percentage of the new range sales will be made.

The trial plan can be used advantageously to create an acceptance for electric cooking, but, selling to the low-income group, presents the question of customer financing which may involve either a rental-purchase plan or a long period of payments, possibly up to 48 months. The dealer should receive a load-building bonus for each rental contract he signs up.

To be popular with the public range rentals should not exceed $1.50 per month, and this should include servicing, which averages, with many companies, approximately 25 cents per month. Many utilities are willing to finance ranges over four years, but cannot see their way clear to handle dealer sales on the same basis. But if the utilities are sincere in the statement that merchandising is to secure load and at the same time know that there is no net profit in merchandising, they should not hesitate to handle dealer sales over a four-year period provided a sufficient interest charge is made to carry the deferred payment and the customer has a satisfactory credit record.

•

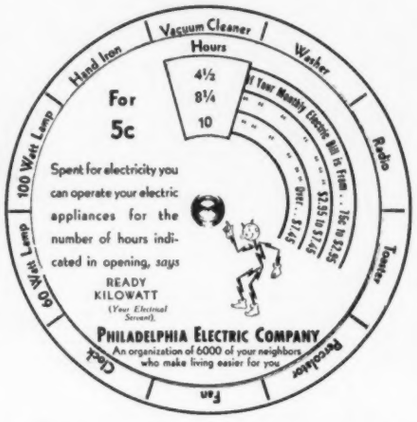
Aids Consumers in Obtaining Loans

Capitalizing upon the opportunities for new revenue offered by the national housing act, the Los Angeles Bureau of Power and Light has established a home modernization section to assist homeowners in obtaining the conveniences of greater electrical usage.

The new department is set up to relieve the homeowner from all of the details involved in obtaining a loan under the act. Members of the department are empowered to complete the forms necessary to apply for the loan, after which the consumer is referred to a co-operating bank from which the loan is to be obtained.

By eliminating the basis for false fears of involved red tape and technicalities, the Bureau of Power and Light feels that the new department will encourage many consumers to make small loans for electrical modernization and at the same time will render convenient service to its consumers. In addition to relieving the consumer of details in obtaining a loan, the department not only offers advisory service on electrical improvements, but also is enabled to give practical, though rough, estimates of the costs of such improvements. Established for a short time, the new department already has proven its worth in arranging for many thousand dollars worth of electrical home modernization.

Showing Them How Little It Costs



Philadelphia Electric Company has prepared this little cost-finder to help the customer see just what the use of each appliance adds to her bill

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"Where Did the Power Go?"

By LEE C. SHELAIN
Central Illinois Electric & Gas Company, Rockford, Ill.

Every power sales engineer has had a customer ask him, "Well, where *did* the power go? You say the meter is right and we must have used it." This question usually comes after the customer has stated that nothing is different this month from last—the same amount of business, and no extra equipment in operation.

The customer invariably is sincere in his statement that nothing is different this month, and still his bill is 10 to 25 per cent higher. But 30 days have elapsed. Can he remember all the details of his factory's operation for those 30 days? That is quite a task for even the works manager, who is usually in very close touch with plant operations.

If daily readings of the power company's meters are taken, however, and a substantial increase should occur over the previous day the reason for it would be plain. Or an investigation is easy if the reason is not known.

With this idea in mind, a simple form was drawn up and distributed among our larger power users. With this form was included a table, which facilitated the calculation of power factor. This table is merely one of natural tangents and cosines, running from zero to 60 degrees. The tangent is calculated by the customer by the simple formula, Rkva.-hrs./kw.-hrs. By reference to the table he finds the corresponding cosine, designated as power factor in the table. A letter from the power engineer is sent with these forms, offering to call and explain the use of the forms if they were interested in keeping a record of this sort. The response to this request was surprising. Many of the customers are now using the information received from the daily readings in computing power cost directly chargeable to production.

The forms were inexpensive. A stencil was made on a typewriter and the forms run off on a mimeograph machine. Most of the customers make additional forms to carry on the record after being given the sample. This idea may seem extremely simple, but it is worth trying out in any territory. We were surprised at the amount of interest it created, not to mention the fact that it is a considerable aid to better customer relations.

ELECTRIC METER READINGS

DATE	KWH METER READING	DIFFERENCE	CONSTANT	KILOWATT HOURS	RVA METER READING	DIFFERENCE	CONSTANT	REACTIVE HOURS	P.F.	DEMAND READING	CONSTANT	KW DEMAND	NOTES AS TO OPERATION
10-1	3408	105	20	2100	6804	60	20	1200	87	34	10	340	Normal
2	3517	109	20	2180	6864	62	20	1240	87	39	10	390	"
3	3632	115	20	2300	6934	63	20	1260	86	36	10	360	"
4	3728	106	20	2120	6992	58	20	1150	88	38	10	380	"

This form interests the power customer in the daily use of energy, rather than the monthly bill for it

News Quells Distrust of Outdoor Metering

By LEE M. NELSON
Commissioner Water & Light Department, Hastings, Neb.

Abrupt and large-scale shift to outdoor metering may, in a small community where information spreads like wildfire, lead to untoward results. Neighbors chuckle when they see the installer place an outdoor meter next door, but become incensed and demand explanation when he comes to their home. Proper publicity can avert this.

When the Hastings, Neb., municipal electric plant decided outdoor meters were the answer to unmetered use of energy a section where there was little such diversion was chosen as the first to have the changeover. We then called in a newspaper reporter who had had some experience in power company activities, explained the significance of the project and asked for news co-operation. What the paper published quieted the fears and criticism and the department had no complaints of the nature otherwise anticipated. Here in part is what the Hastings *Daily Tribune* ran in its columns:

ELECTRIC METERS OUTDOORS IN MODERNIZATION PROGRAM

Many Advantages Found in New System to Be Installed First in East Section of City

The newest type of outdoor meters will be installed in the east portion of Hastings as part of a modernization project of the water and light department, it was learned today from Commissioner Lee M. Nelson. . . .

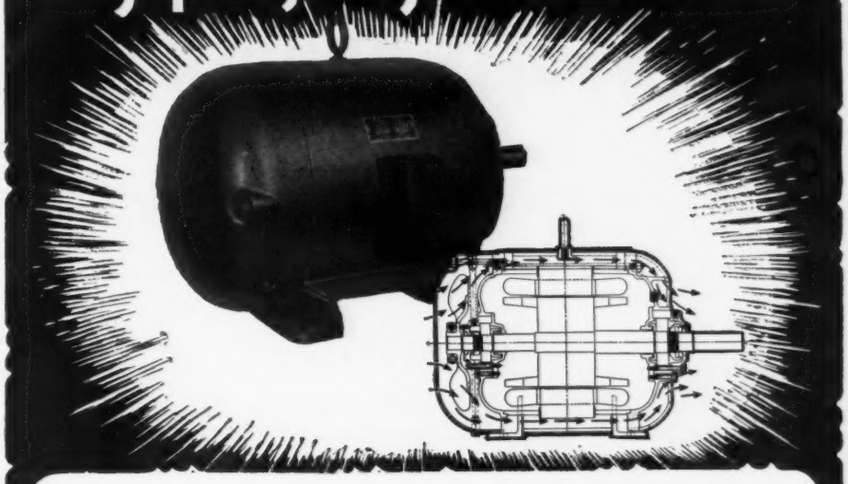
The outdoor meters have been available only a few years. The principal advantage will be in the saving of time for the meter readers. At present it is necessary for the men to knock at the door, enter the house and usually go to some out-of-the-way place to read the meter in a dark corner. Under the new system the men will simply walk along the rear of the houses with only a pause to read the meters. Actual tests made, according to Mr. Nelson, show that a man will read the instruments three times as fast with outdoor mountings.

The change will also eliminate the necessity of a second call to read the meters at houses where the residents are not at home on the first call, or where the readers are otherwise unable to gain entrance. The department now employs one man full time making these second readings.

With the new meters installed, residents will be relieved of the possibility of robbery. Many cases have been reported, though not often here, where thieves have represented themselves as meter readers to gain entrance to homes. There will be no need for city men to enter homes, where the new meters are installed, except to read water meters.

Many embarrassing situations also may be saved when the readers no longer find it necessary to enter the homes. Recently, one reader knocked on a grade door, but apparently was not heard by the owner of the home. He entered the house and went into the basement to read the meter. He was heard going down the stairs, and on his return faced a loaded revolver. Fortunately, the woman was not nervous and recognized the man before she pulled the trigger.

You pay LESS by paying MORE!



Of course, Wagner type CP totally-enclosed fan-cooled motors cost more than Wagner open-type motors — there's more material and more labor involved in their manufacture.

But you pay less in the long run — for there are other items of expense in addition to the first (purchase) cost.

Open-type motors must be cleaned out periodically—and that means shutdowns, curtailed production, and maintenance expense. If the motors are subjected to *abrasive* dust or *corrosive* fumes—then there's the factor of motor life to consider.

When Wagner type CP totally-enclosed fan-cooled motors are used, such subsequent expenses are eliminated, because they are dust-proof, fume-proof, and moisture-proof.

These motors are provided with *two* frames —

— an outer frame which guides a strong cooling draft over the motor

— an inner frame thru which nothing obstructive or injurious can get into the motor.

Lower your overhead—stop production losses—with Wagner type CP motors.

Pay *less* — by paying *more!*

Sign and mail this coupon for a complete description of Wagner type CP motors.

Wagner Electric Corporation
6400 Plymouth Ave., St. Louis, Mo.
Please send complete information regarding Wagner type CP motors.

Name _____ Position _____

Firm _____

Address _____ L234-8

Wagner Electric

MOTORS - TRANSFORMERS - FANS - BRAKES

BETTER LIGHT-BETTER SIGHT PROGRAM PAYS DOUBLE DIVIDENDS IN FEW MONTHS

Results show practical benefits to utilities and public

● From coast to coast reports pour into Nela Park from utilities, jobbers, retail outlets, electrical dealers and contractors, architects, and from many other sources, showing the definite advantages they have secured in just a few months' time by putting the Science of Seeing to work in the form of Better Light-Better Sight programs. The general public especially has been quick to realize the value and practical benefits of the Better Light-Better Sight idea.

Specifically, during the latter part of 1934, utilities have given full time employment to more than 1250 women engaged to devote all their time on home lighting work, and to more than 1250 men to spend all their time on commercial and industrial lighting work. All of these people, in addition to thousands of others, were trained in the new Science of Seeing selling approach in schools conducted by the General Electric Lighting Institute.

Sales of I. E. S. Better Sight lamps for study and reading and also sales of direct and indirect portable lamps reached an estimated total of approximately 300,000. More than 1,000,000 lamps of the "Pin-it-Up" type have been sold in the last 18 months. And Sight Meters have been put to work at a rate of better than 1000 a month.

By the time this advertisement is published, it is estimated that more than 30 sight saving councils will have been organized in leading cities throughout the country.

These organizations, as well as many others that are being and have been established with a view to permanency of operation, indicate that the Better Light-Better Sight program is more than a mere temporary affair . . . it has become a vital part of the whole electrical industry.

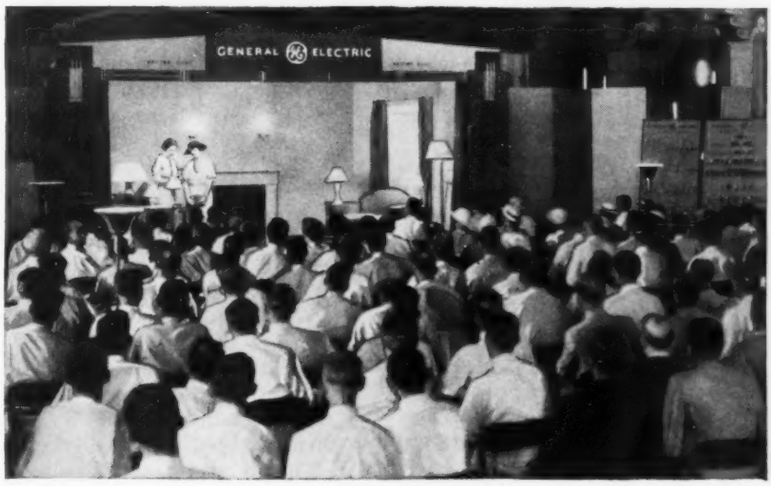
We suggest that you write us for the newest, up-to-the-minute ideas for utilities to use to develop lighting markets in line with the Science of Seeing. Plans perfected and put into operation now will do a great deal toward increasing your 1935 load. General Electric Company, Nela Park, Cleveland, Ohio.

GENERAL

GENERAL ELECTRIC LIGHTING SALES INSTITUTE TRAINS 8399 PEOPLE IN "NEW APPROACH"

Conducts sales courses in 54 leading cities

● The General Electric Lighting Sales Institute has just completed an important part of the Better Light-Better Sight program. It has conducted sales courses in home lighting and in commercial and industrial lighting in 54 leading cities from coast to coast . . . and in the past few months has given 8399 people the necessary training required to put across all phases of the "new approach" in selling lighting.



A typical group attending one of the lighting sales courses conducted by the General Electric Lighting Sales Institute.

People attending these courses included men in commercial and industrial lighting departments and home lighting representatives employed by utilities, as well as key people in department stores and electrical wholesalers' organizations, contractors, architects, lamp and fixture people, and many others with a real interest in lighting.

In the 54 cities, 3487 people attended the commercial and industrial lighting courses, 3043 attended the home lighting courses, and 1869 others took both courses . . . a total of 8399!

In the same cities 26,574 people heard the "Science of Seeing" talk and attended 196 meetings held outside the regular sales courses.

Besides these courses, there have been a number of schools conducted both by Nela Park representatives and by General Electric division representatives.

For the most recent information on how to take full advantage of the New Approach in selling lamps and lighting in your locality, write to the Sales Division of the Incandescent Lamp Department, General Electric Co., serving you.

GE ELECTRIC

General Electric manufactures lamps for home lighting and decoration, automobiles, flashlights, photography, stores, offices and factories, street lighting and signs. Also Sunlight lamps.

MEN OF THE INDUSTRY

Dr. Whitney New Recipient of Edison Medal

Dr. Willis R. Whitney, who was recently awarded the Edison Medal by the American Institute of Electrical Engineers (ELECTRICAL WORLD, December 22, page 46), is known particularly for his notable contributions to the creation and development of the research laboratory of the General Electric Company at Schenectady. His broad, scientific

W. R. Whitney

knowledge, his resourcefulness in experiment, his energy, enthusiasm and optimism, combined with a clear sense of proportionate value, laid the foundation for and guided and inspired all the work of the laboratory.

A native of Jamestown, N. Y., and a graduate of the Massachusetts Institute of Technology, Dr. Whitney spent many years on the teaching staff of the institute following graduation. He assumed the directorship of the research laboratory of the General Electric Company in 1900, became vice-president and director of research in 1928, and vice-president in general charge of research in 1932.

Among the other awards which have been bestowed on Dr. Whitney are the Willard Gibbs medal, the Chandler medal, the Perkin medal, the gold medal of the National Institute of Social Sciences and the Franklin medal. He is a past-president of the American Chemical Society and the American Electrochemical Society and a member of the American Institute of Electrical Engineers and of other associations.

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▶ W. W. LARAWAY, manager of the Consumers Power Company at Big Rapids, Mich., has retired from active service after approximately twenty-seven years of service in various capacities with the company and its predecessors. A. P. MILLER has been appointed to succeed Mr. Laraway. Mr. Miller is also a veteran of the Consumers Power organization, having joined the old Grand Rapids Edison Company in 1902.

•

A. C. Spurr Appointed Head of West Virginia Utility

A. C. Spurr, prominently identified with the transportation industry in Pittsburgh, has been named president of the Monongahela West Penn Public Service Company with headquarters in Fairmont, W. Va. He is succeeding Captain George M. Alexander, who recently retired.

Following graduation from Yale University, Mr. Spurr entered the employ of the Baltimore & Ohio Railroad Company and subsequently served as consulting engineer on re-organization of the Pittsburgh Railways for four years. Later he was appointed vice-president and general manager of the Wheeling Traction Company. Transferring his interest to Pittsburgh, he directed all bus operations of the West Penn System and later became president of the Blue Ridge Lines with headquarters in Hagerstown, Maryland. For the past ten months he has served as assistant to the president of the West Penn System.

•

▶ WADE O. MARTIN has been named chairman of the Louisiana Public Service Commission to succeed Harvey G. Fields, resigned.

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▶ DR. ERNST F. W. ALEXANDERSON, consulting engineer for the General Electric Company and noted for his contributions to the development of radio, has been elected to membership in the Royal Academy of Science of Sweden.

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▶ DR. KARL T. COMPTON, president of the Massachusetts Institute of Technology, was elected president of the American Association for the Advancement of Science at the meeting held last week in Pittsburgh. Dr. Compton will succeed Prof. Edward L. Thorndike of Columbia University.

•

▶ FRANK R. DEVLIN has been appointed a member of the California Railroad Commission to fill the vacancy caused by the resignation of Clyde L. Seavey. Mr. Devlin was a member of the commission from 1915 to 1921.

R. E. Ritchie Assigned to New Executive Duties

R. E. Ritchie, assistant to Harvey C. Couch, president of the Arkansas Power & Light Company, Little Rock, became active vice-president of that company January 1, succeeding C. J. Griffith, whose retirement from active service was announced by the directors. Mr. Griffith will remain with the company in an advisory capacity. He was

R. E. Ritchie

manager of the company's Little Rock properties during his administration as vice-president.

Mr. Ritchie has been with the company since 1923. Though a native of Texas, most of his life has been spent in Arkansas. After some railway experiences, his first position with the Arkansas Power & Light Company was assistant to the vice-president and general manager, a position he held until made general superintendent in 1925. In August, 1927, he became Mr. Couch's assistant.

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▶ SIMEON DYER, for the past eight years an illuminating engineer in the sales department of the Edison Electric Illuminating Company of Boston, has been appointed illuminating engineer of the Central Maine Power Company, with headquarters at Augusta. He will have charge of an active development of industrial and commercial lighting business now being launched by the company in addition to its promotion of residential illumination.

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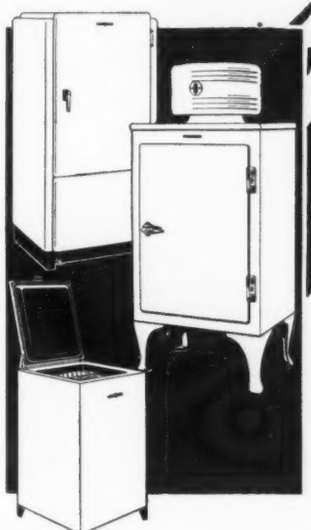
▶ DR. IRVING LANGMUIR, associate director of the research laboratory of the General Electric Company, has been awarded the fourth order of the Rising Sun by the government of Japan, where he has

THE NEW AGE OF LIVING ELECTRICALLY

40 BILLION HOURS

of dependable performance!

The famous G-E Monitor Top now has a combined total of more than 40,000,000,000 operating hours and a record of dependable performance that is without parallel! G-E retailers know the sale of a Monitor Top refrigerator means a satisfied customer and relief from costly service worries that eat into net profits.



Refrigerator shoppers can see *all three* types of electric refrigerators at the General Electric retailer's . . .

- General Electric Monitor Top refrigerator. *Matchless performance!*
- General Electric Flat-top refrigerator. *Distinguished new styling!*
- General Electric Liftop refrigerator. *Lowest cost.*

The greatest advertising and sales promotion program in three years on

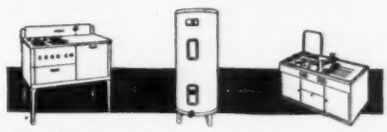
GENERAL ELECTRIC

KITCHEN APPLIANCES

IN 1935 General Electric will speed the tempo of electrical living with the greatest advertising and sales promotion program in 3 years—featuring G-E refrigerators, G-E ranges, G-E dishwashers and other appliances in the complete General Electric Kitchen.

"How long will an electric refrigerator last" is the question General Electric will ask refrigerator buyers in 1935. And this year will see a rediscovery of true refrigerator values. The refrigerator "that can take it"—the refrigerator with a performance record that *proves* how long it will last—is the one that will out-sell and show the greatest *net profit* when your books are balanced.

The matchless performance record of the G-E sealed-in-steel refrigerator mechanism is the greatest refrigerator sales story ever told. The huge advertising and sales promotion campaign will broadcast the story to millions. *You* can profit. Write or wire for details. General Electric Co., Specialty Appliance Sales Dept., Section DW11, Nela Park, Cleveland, Ohio.



The G-E Automatic Electric Range, General Electric Water Heater, General Electric Dishwasher and the complete General Electric Kitchen will be spotlighted in General Electric's 1935 sales program.

an emblem

symbolizing

a PUBLIC SERVICE

dedicated to Progress
in Commerce, Industry and the Home

☆

COLUMBIA SYSTEM is a vital force in the continuing development of a territory embraced by eight contiguous States, serving an important area advantageously located to benefit by future commercial, industrial and residential growth.

☆

COLUMBIA GAS & ELECTRIC
61 Broadway CORPORATION New York

been delivering a series of lectures for the Iwadare Foundation, which is operated by the Japanese Institute of Electrical Engineers.

▶ SIR ARCHIBALD PAGE has been appointed chairman of the British Central Electricity Board to succeed Sir Andrew Duncan, resigned. Sir Archibald assumed his new duties January 1.

▶ C. K. WEST, vice-president of the General Electric Company with headquarters in Philadelphia, has been elected president of the Electrical Association of Philadelphia. Mr. West is succeeding Horace P. Liversidge, vice-president of the Philadelphia Electric Company.

▶ CLARK H. MINOR, president of the International General Electric Company, has been awarded the Fourth Order of the Rising Sun by the Japanese government.

▶ ROBERT T. PAINE II, for forty years a director of the General Electric Company, has resigned. A native of New England, Mr. Paine was elected to the board in 1894, two years after the formation of the company and in the middle of the worst year in the history of its operations. His resignation was submitted because of ill health. For forty years he has participated in most of the important decisions involving the destinies of General Electric, and the value of his advice has been enhanced by broad experience in many other lines of business.

▶ ROBERT F. MCCLOSKEY has been elected director and vice-president of the Blaw-Knox Company in charge of operations of the plants located at Blawnox, Pa., to succeed the late Wayne Rawley. Mr. McCloskey was previously general superintendent of the company's Blawnox shops. He has been associated with the company since 1920.

▶ JOHN J. GIBSON, director of the general service department of the National Electrical Manufacturers Association, has resigned in order to move to Philadelphia to attend more efficiently to his personal interests there and elsewhere. Prior to joining the Nema staff in 1933 he had been associated for more than thirty-two years with the Westinghouse Electric & Manufacturing Company, from which organization he retired in 1932. At the time of his resignation he was occupying the position of vice-president of the Westinghouse Electric Supply Company. The responsibilities of Mr. Gibson as director of the Nema general service department will be taken over by R. BOURKE CORCORAN, formerly manager of the Electric Association of Chicago, and who has been identified with Nema for approximately one year.

ROEBLING

RUBBER *Insulated* CABLES

To exactly meet diversified requirements, Roebling Rubber-insulated Wires and Cables are made with a wide variety of insulating compounds. The Roebling Line includes, in part:

Rubber-insulated and Braided Wires and Cables: Code; Intermediate; 30% and 40% Performance; 35% and 40% Performite. Plain Rubber 60% Sheath Power Cable; 40% and 60% Sheath Flexible Cords. Parkway, Service, Mining, Welding, and Control Cables; Tree Wire.

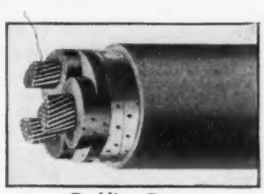
These cables are available in a wide range of sizes and voltages. Armors:—steel, zinc, or bronze tape, or round steel wire.

We would be glad to send you complete information on request and would welcome your inquiry for samples and prices.

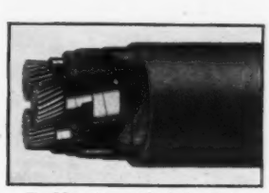
OVER 60 OTHER TYPES

Power Cables: Paper; Cambric; Rubber » Parkway Cable » Tree Wire » Service Cables » Station Cables » Rubber Covered Control Cables » Rubber Covered Wires and Cables: Code; Intermediate; 30% and 40% Performance; 35% and 40% Performite; Plain Rubber 60% Sheath Power Cable and 40% or 60% Sheath Flexible Cords » Slow Burning Wires and Cables » Weatherproof Wires and Cables » Submarine Cables » Portable Cords » And a wide variety of other wires and cables.

JOHN A. ROEBLING'S SONS CO., TRENTON, N.J.
Branches in Principal Cities

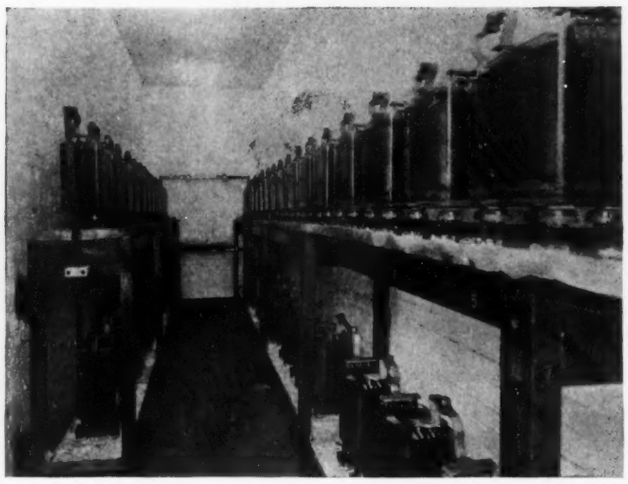


Roebling Paper Insulated Cable.



Roebling Varnished Cambric Insulated Cable.

ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING JAR



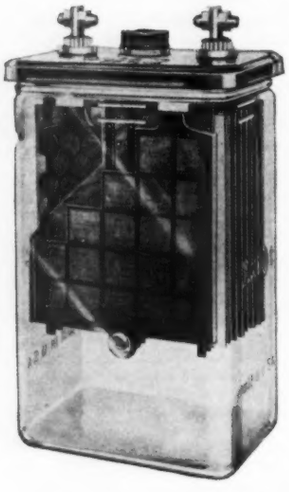
The 30-year-old Exide-Chloride Battery which was replaced last year. This battery, together with three others in the P. R. T. Company's service, had an aggregate life of 102 years.

102 Years of Service—

that was the aggregate life of these 4 Exide-Chlorides

THIRTY years ago the Philadelphia Rapid Transit Company installed the Exide-Chloride Battery pictured above, in its Snyder Avenue Substation. Ten years later the battery was transferred to the Company's Dauphin Street Substation where it remained in service—floating on the line and operating the oil switches—until replaced, late last year, with another Exide-Chloride. At each of three other P. R. T. Substations, Exide-Chloride Batteries served 27, 23 and 22 years respectively without major repairs, until their replacement last year.

Such consistently satisfactory service speaks eloquently for the kind of reliability that is built into Exide-Chloride Batteries.



Modern Exide-Chloride Cell with sealed glass jar used in control bus battery service.

Why not place *your* dependence upon Exides? Investigation will show that your confidence in them is shared by many of the foremost engineers here and abroad.

THE ELECTRIC STORAGE BATTERY CO.
Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto

NRA CODE

Exide
BATTERIES

OBITUARY

▶ J. THANE KUHLMAN, treasurer of the Kuhlman Electric Company, Bay City, Mich., died December 3. He was 43 years of age.

•

▶ WAYNE RAWLEY, vice-president and a director of the Blaw-Knox Company, died at Miami Beach, Florida, November 16, in his fifty-sixth year. Previous to his association with the Blaw-Knox Company, Mr. Rawley was connected with the Carnegie Steel Company, the Cambria Steel Company, the Pencoyd Iron Works and the Riter-Conley Manufacturing Company. In 1912 he was elected vice-president of Blaw-Knox.

•

▶ DANA PIERCE, widely known electrical safety engineer in the field of fire and accident prevention, died suddenly, of a heart attack, December 18 in Atlantic City. He was 63 years of age. After an early career as teacher in eastern schools, Mr. Pierce went to Chicago as director of the electrical department of the Underwriters' Laboratories. In 1923 he was named president of the organization. He was also a past-president of the National Fire Protection Association, and for ten years was chairman of the committee which promulgated the National Electrical Code. He was a fellow of the A.I.E.E.

•

▶ DR. MILO S. KETCHUM, dean emeritus of the college of engineering, University of Illinois, died December 19, in his sixty-third year. His activities, apart from his work as an educator, were varied. He was a member of the engineering firm of Crocker & Ketchum in Denver during 1909 and 1910 and from 1918 to 1919 he was assistant director of the Federal explosives plant at Nitro, W. Va. At one time he was connected with the Gillette-Herzog Manufacturing Company as contracting and designing engineer and later with the American Bridge Company as contracting manager in charge of the Kansas City (Mo.) office. For many years he carried on a consulting engineering practice. In the course of his academic career he was affiliated with the University of Colorado and with the University of Pennsylvania. Since 1922, until his retirement, he had served as dean of the college of engineering and director of the engineering experimental station at the University of Illinois. For two years Dean Ketchum headed the Society for the Promotion of Engineering Education. He is a fellow of the American Association for the Advancement of Science and a member of the American Society for Testing Materials and of other technical societies.

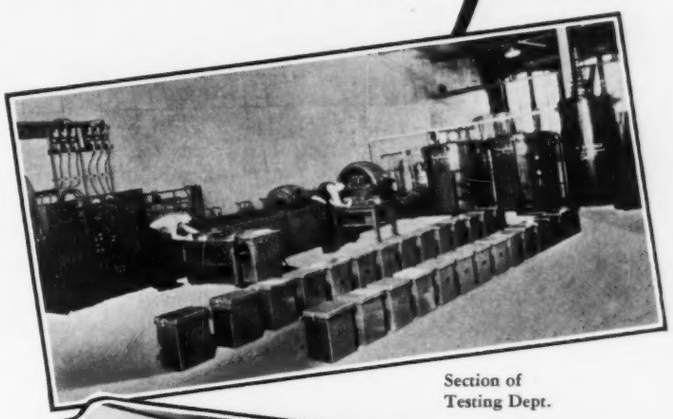
A modern, new home for

PENNSYLVANIA TRANSFORMERS

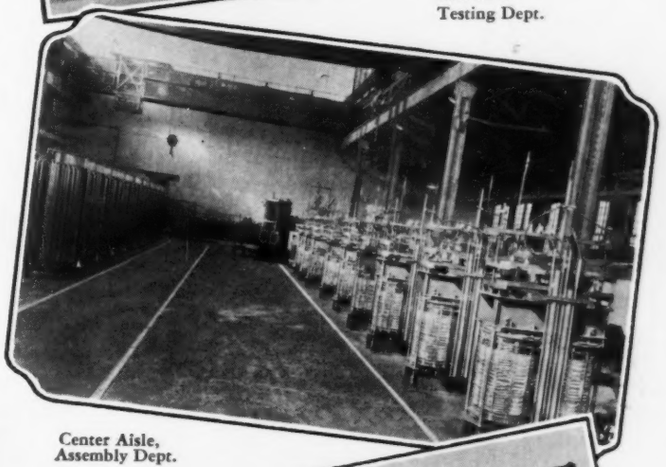
THIS new, spacious daylight plant offers the necessary facilities for building still greater quality into Pennsylvania Transformers. The manufacture of all parts, assembling and testing are now under one roof in charge of an organization with a quarter of a century of experience. We are equipped to build power and special transformers up to 25,000 KVA, as well as a complete line of distribution transformers.

Pennsylvania wishes you a happy and prosperous New Year.

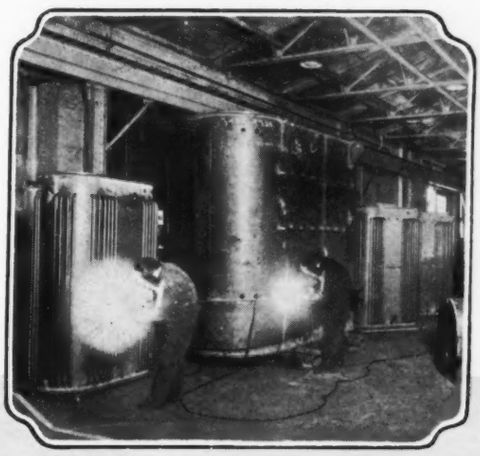
PENNSYLVANIA TRANSFORMER CO.
1629 Island Ave., N.S.
Pittsburgh, Pa.



Section of Testing Dept.

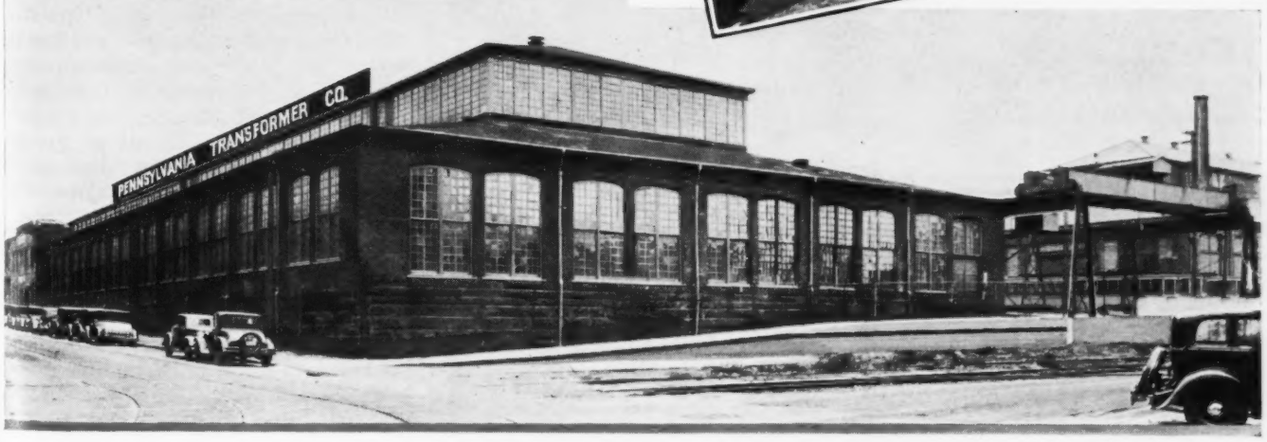


Center Aisle, Assembly Dept.



Welding Dept.

Loading Yard



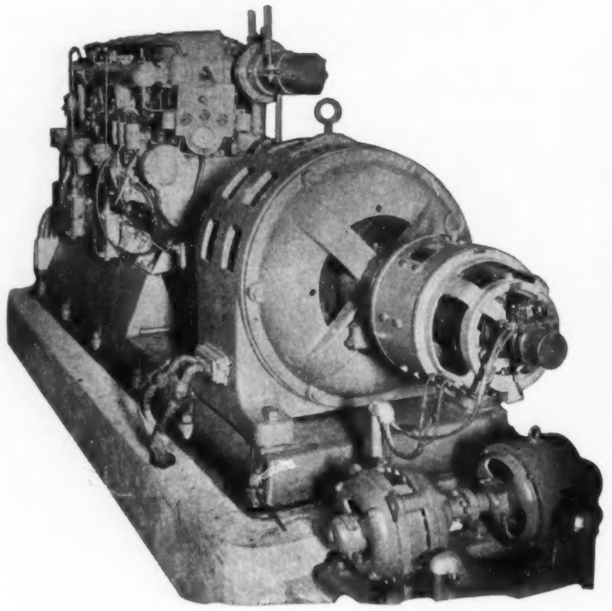
AUTOMATIC STARTING!

when main power fails

Eliminates attendants, and provides quick emergency service. A patented system of solenoids and relays automatically turns on the fuel valve, depresses spark and throttle levers, throws ignition switch to contact, operates the primer, and, when the engine starts, brings it up to speed on the governor—in from 3 to 15 seconds. Sets in operation at Wilkes-Barre, Pa.; San Rafael, Calif.; Bank of Japan, Tokio; and others in process.

Sterling High Duty Internal Combustion Engines

12 to 565 B.H.P., Gas or Gasoline



For power in emergency in the Bank of Japan, Tokio, a Dolphin C-6 cyl. 150 H.P. Sterling engine at 1000 R.P.M. direct connected to a 75 KW. generator.

STERLING ENGINE COMPANY

1270 Niagara St., Buffalo, New York

Dept. C-2

900 Chrysler Bldg., New York, N. Y.

Recent Rate Changes

Public Service Company of Colorado's rate case will have to be carried to the state Supreme Court under a recent ruling by District Judge George F. Dunklee in Denver, who denied a petition for a writ of review brought by certain consumers against the state Public Service Commission and the utility company. The commission had denied last August the consumers' petition to compel conferences before the commission on the grounds that it did not have jurisdiction over rates in Denver because that city is a "home rule" city under the charter provision in the Twentieth Amendment to the state Constitution.

•

Mississippi Power & Light Company's second compromise rate reduction of $163,500 has been rejected by the city of Jackson. January 19 has been set for a vote on a $1,500,000 bond issue with which to build a municipal plant and distribution system. City officials also ordered, effective January 3, a rate reduction of 25 per cent, which the power company is seeking to enjoin in the federal court.

•

Montreal Light, Heat & Power Consolidated's new rate schedule, amended to favor the small consumer, has been approved by the Public Service Commission of the Province of Quebec. The company had estimated that through reductions it recently put into effect in new schedule it stood to lose $370,000 a year from revenues; it is now estimated that the amendments made by the commission will cost company additional loss of $126,000 annually.

•

Georgia Public Service Commission has postponed its projected inquiry into commercial power rates of public utilities operating within the state until January 21 at the request of the companies. Evidence from the Georgia Power Company will be heard January 21, from the Savannah Light & Power Company January 24.

•

Pennsylvania Public Service Commission has ordered fourteen additional electric, gas, water and telephone companies to reduce charges to consumers or to show cause why they should not do so. The companies, whose names were not made public, were given until January 15 to answer the commission's order. Similar orders sent to 50 companies last October resulted directly or indirectly in rate reductions totaling $1,413,000 annually.

•

Louisiana Public Service Commission has begun an investigation into the rates being charged by the New Orleans Public Service, Inc., and the Baton Rouge

Specialists in COMPOSITE CABLES

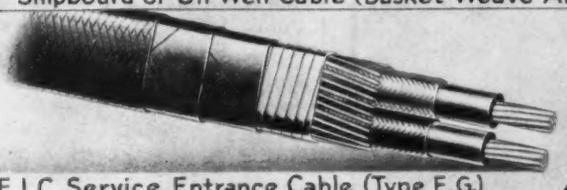
Leadless Submarine Power Cable

Oil Well Rope (Conducting Center)

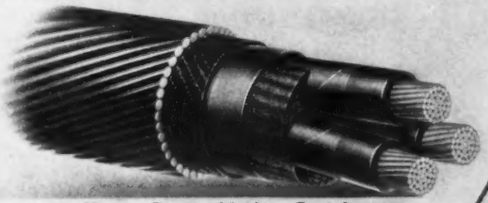
Service Entrance Cable

Armorlokt Parkway Cable

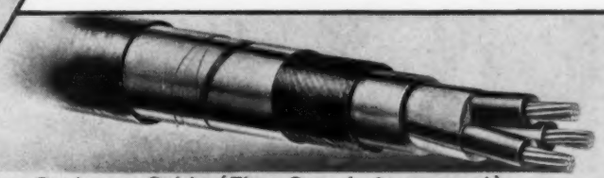
Shipboard or Oil Well Cable (Basket Weave Armored)



A.E.I.C. Service Entrance Cable (Type E.G.)



Leadless Bore Hole Cable



Parkway Cable (Flat Steel Armored)

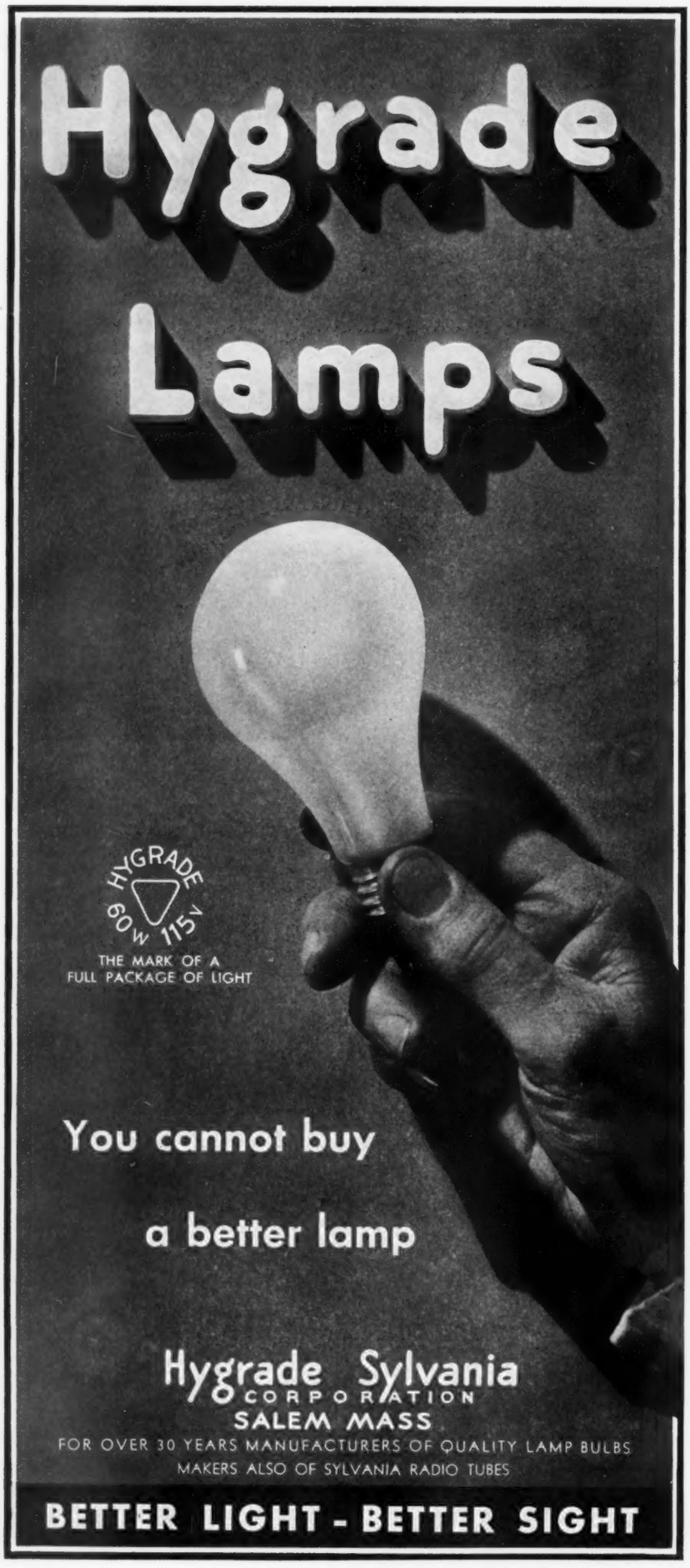
ELECTRICAL CABLE—The thought usually brings to mind "copper conductors." As a matter of fact these are frequently but a small fraction of the total weight or volume of the cable. Other metals, particularly steel, play important roles in cable design and operation. A few typical cases are illustrated. **American Steel & Wire Company** specializes in the production of both steel and insulated copper members of such cables and is prepared to furnish practically every type in which these members enter. Inquiries on standard or special designs are earnestly solicited.

AMERICAN STEEL & WIRE COMPANY

208 SOUTH LA SALLE STREET • • CHICAGO

Offices in All Principal Cities

United States Steel Corporation Subsidiary



Electric Company. The companies agreed to bear the expense of the investigation after Senator Huey Long threatened to call the Legislature into special session unless the utilities would agree to pay for the costs without protesting the right of the state to collect it, as had been done by the New Orleans utility.

•

Maritime Electric Company, Ltd.'s, appeal to the Supreme Court of New Brunswick from an order of the Board of Commissioners of Public Utilities reducing electric rates in Fredericton $17,000 annually has been sustained. The court held that the city had not adduced proper evidence to establish that the rates are unreasonable. The court further held that "it is not unreasonable that a public utility should pay dividends upon capital which has been honestly and prudently invested, even though some of these investments should no longer be useful in public service."

•

Illinois Power & Light Company has been ordered by the State Commerce Commission to effect rate cuts in central and southern Illinois territory amounting to an estimated $150,000 annually. The cut in residential rates is estimated at $75,000, or 10 per cent. A similar reduction in commercial rates, effective January 8, also amounts to 10 per cent.

•

Dayton Power & Light Company's domestic and commercial users in 68 communities in the system have obtained additional reductions in electric rates which apply to suburban territory as well as to unincorporated towns. The new residential rates filed with the Ohio Public Utilities Commission are as follows: Residential, first 30 kw.-hr. 8 cents, next 50 kw.-hr. 6 cents, over 80 kw.-hr. 3½ cents; commercial, first 100 kw.-hr. 7 cents, next 100 kw.-hr. 5 cents and over 500 kw.-hr. 4 cents.

•

Philadelphia Electric Company has announced rate changes, effective January 5 that will effect a reduction of more than three-quarters of a million dollars in the annual bills of a class of the company's customers exceeding 110,000 in number. The changes relate to the charges for general light and power service, known as the retail light and power rate. The largest number of accounts affected are where residence service is supplied along with service to small stores and office quarters.

•

Metropolitan Edison Company has announced an additional cut in rates amounting to an annual saving to consumers estimated at $130,000, effective January 3. The company had just made a cut in its domestic and commercial rates that gave its customers an annual saving of approximately $472,000.

INTERNATIONAL TRUCKS

LOWEST-PRICED 1½-ton 6-cylinder TRUCK IN INTERNATIONAL HISTORY

● International Harvester now offers by all odds the best value in this popular field, considering beauty of design, high standards of quality throughout, and operating economy. A 78.5 h. p. engine and sturdy ALL-TRUCK construction in a truck of ultra-modern style. Inquire of one of our 217 Company-owned branches or of any International Truck dealer. See the new Model C-30 and others of the new streamlined Internationals now on display everywhere. Better still, try one out on your own job.

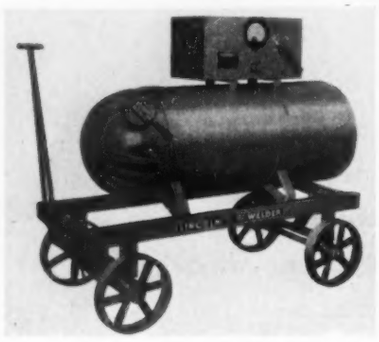
INTERNATIONAL HARVESTER COMPANY
606 So. Michigan Ave. OF AMERICA (INCORPORATED) Chicago, Illinois

This is the Model C-30 with stake body. Other sizes in the International Truck line range from ½-ton to 10-ton. Chassis prices start at $390 f. o. b. factory.

NEW EQUIPMENT

Alternating-Current Welder

Alternating-current welder, "Shield Arc AC," which converts a higher frequency most suitable for arc welding with either heavily coated or washed electrodes in all positions, has been announced by the Lincoln Electric Company, Cleveland, Ohio. The following advantages over the usual a.c. transformer type of welder are claimed: More stable arc, less magnetic



Lincoln Electric

blow, easier starting of arc; less spatter loss and greater density; unbalancing of phases is eliminated; power factor approximately double that of the transformer type.

The welder is built in two sizes. The smaller capacity machine can be used for continuous welding with electrodes of $\frac{3}{32}$ to $\frac{5}{16}$ in. in size; the larger capacity welder handles electrodes from $\frac{1}{8}$ to $\frac{3}{8}$ in. in size. Current from the line is said to be no more than that drawn by the usual d.c. motor-generator type and a fraction of that drawn by the transformer type.

•

Electric Air Horn

To meet the requirements for a penetrating and powerful signal without the necessity of steam or compressed air piping, an air horn that creates its own air supply was developed by the Federal Electric Company, Chicago, Ill. It utilizes as the sound-producing member the same type of vibrating-diaphragm compressed air horn employed by Federal in its large fire alarm horns. The horn member is directly attached to a special type of compressor that furnishes air as required by the horn and which is driven by a fast, highly accelerated, heavy-duty type motor.

The electric-air horn is equipped with relay for connecting into fire alarm, paging and other signaling systems. Code signals may be sent on it on a timing of one or two seconds per impulse. It can be furnished for 12, 24 or 32-volt storage battery operation and for 110 and 220-volt a.c. or d.c. supply.

•

CIRCULATOR FAN with aeroplane type of propeller has been announced by the Marathon Electric Manufacturing Corporation, Wausau, Wis. It is available in sizes 18, 20, 22, 24, 26 and 30 in. for any of the voltages used in a.c. or d.c., single or three phase.

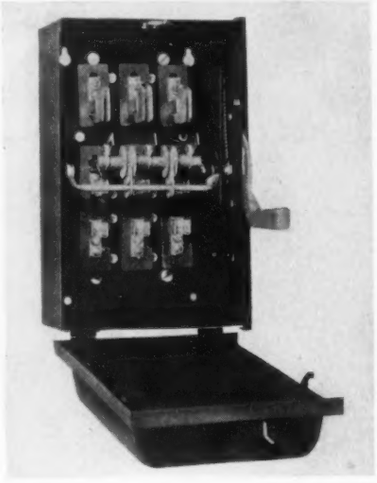
•

A THERMOSTAT, designated S3, which is so constructed that it can be easily and quickly mounted in back of the switch panel with the operating knob conveniently located adjacent to the switch handle, has been announced by the Hart Manufacturing Company, Hartford, Conn. It is possible to mount this thermostat in the back of the oven with remote control operating handle and dial on the back splasher, it is claimed. It is so constructed that it is not necessary for the actuating element to extend into the oven proper. It may be made in double pole if desired.

•

30-Amp., 80,000 Series Switch

A new type of 30-amp. switch for the 80,000 line has been announced by the Square D Company, Detroit, Mich. It has a front operating handle and the cover opens down instead of at the side. The

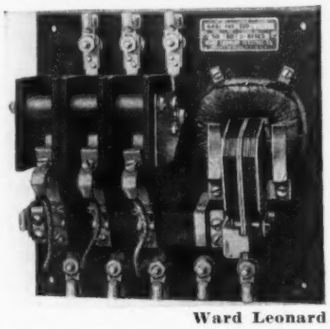


Square D

construction permits a smaller inclosure than for the conventional type of visible blade switch. This design is obtainable in 30-ampere, two- and three-pole fused and unfused and three- and four-wire solid neutral.

A.C. and D.C. Contactors

A line of d.c. and a.c. contactors that for several years have been used in their control assemblies and are now available as separate units have been announced by the Ward Leonard Company, Mount Vernon, N. Y. They can be used as control contactors for motors, for disconnect purposes in conjunction with suitable auxiliary switches, for electric ovens, vari-



Ward Leonard

ous other electric control applications and for special control panels. High contact pressure with low operating and holding currents in the coil are among the features claimed for these contactors.

•

All-Metal Vacuum Switch

Although only about $\frac{3}{4}$ in. in diameter and $1\frac{1}{2}$ in. long, a small vacuum switch which can be operated by a fraction of an ounce of pressure has been announced by the General Electric Company. It is capable of interrupting as much as 5 hp. as fast as thirty times a second, according to the manufacturer. Designed as the type FA-6 vacuum switch, this device is rated at 10 amp., 250 volts d.c. or 440 volts a.c., or 5 amp. at 500 volts d.c. It is made of steel, hydrogen-copper-brazed and exhausted to a high vacuum through a hollow steel operating stem, and can be used in almost any location, including those where it is subject to severe shock and vibration.

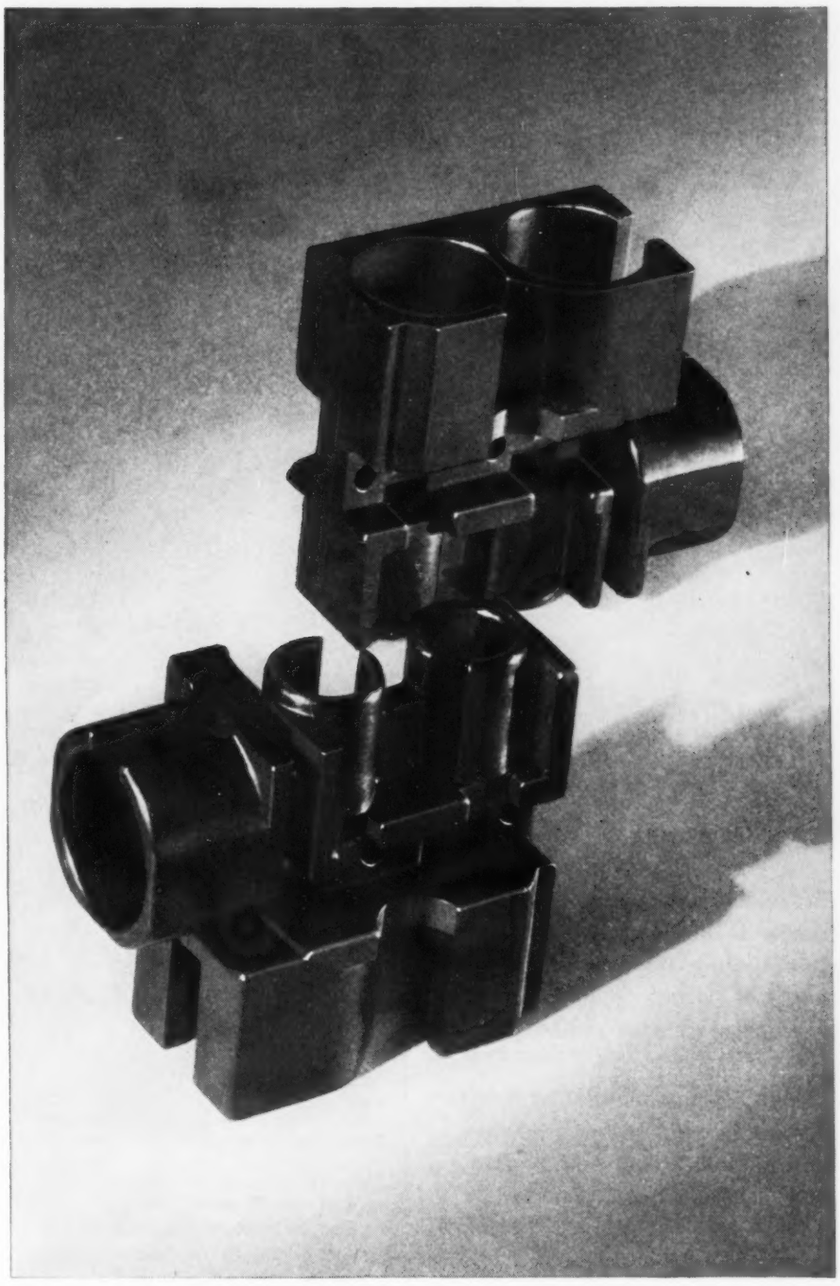
•

Pump Impeller on Motor Shaft

Built together to conserve space, to facilitate installation, to reduce weight and to reduce maintenance is a built-together motor-pump unit recently developed by Fairbanks, Morse & Company, Chicago, Ill. The unit consists of a highly efficient centrifugal side-suction pump with a closed bronze impeller mounted directly on the shaft of a ball-bearing splash-proof motor. These motor-

Strength and Safety *in this*

intricate Fuse Holder of Bakelite Molded



USED IN the mechanism of National Acme's Chronolog, this fuse holder is an excellent example of the use of Bakelite Molded in solving an electrical insulation problem and in cutting production costs.

Extremely intricate in design, it possesses the strength and insulating properties of Bakelite Molded—is unaffected by climatic conditions, temperature, humidity, moisture, fumes, oil or grease and will not deteriorate through age or long use.

The part shown is completely formed in a single operation. All holes, channels, grooves, ribs, lugs and recesses are simultaneously molded to close dimensions and accurately positioned.

We welcome the opportunity to cooperate with manufacturers and engineers in adapting Bakelite Materials to their particular requirements. Illustrated Booklets 3M, "Bakelite Molded" and 3L, "Bakelite Laminated" give complete information and describe many of the latest applications.

Photos show fuse holders of Bakelite Molded used in the Chronolog Idle Time Controller (Courtesy The National Acme Co., Cleveland) and a number of Chronologs serving automatic screw machines.

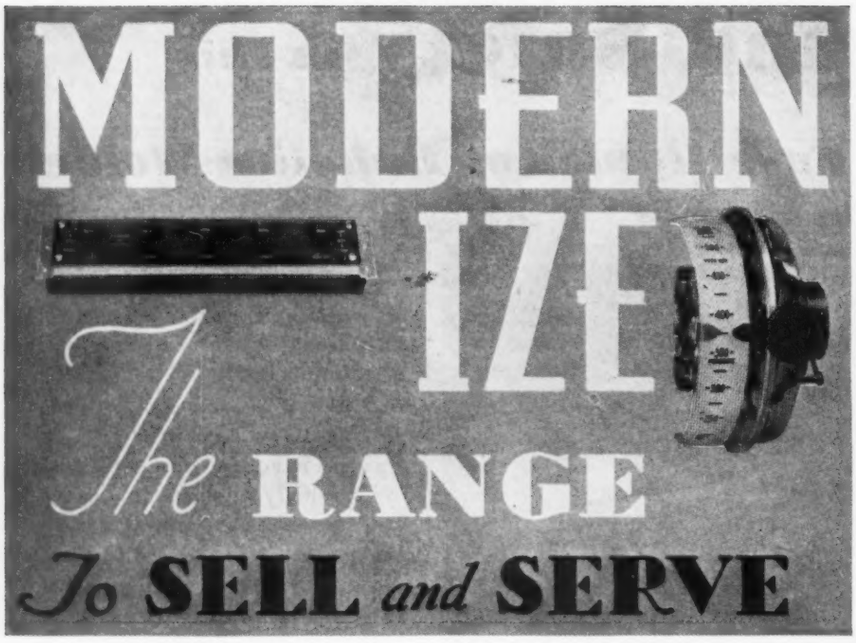
BAKELITE CORPORATION, 247 Park Avenue, New York, N.Y. ..... 43 East Ohio Street, Chicago, Ill.
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

BAKELITE

REGISTERED U. S. PAT. OFF.

"The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products"

THE MATERIAL OF A THOUSAND USES



THE trend is toward modernization of the electric range to properly stand up against competition as well as to give the user better service satisfaction.

Here are two "Diamond H" contributions to improvement in range design and service:

The NEW "DIAMOND H"

12992 - HEAT SWITCH PANEL & "S3" FLUSH MOUNTING THERMOSTAT

Modern in operation—sound in engineering—the "Diamond H" Two-heat Range Switch is a simple, positive-action, trouble-proof panel requiring less wiring cost and far less attention than old type switches.

Silver-to-silver contacts have won endorsement of range makers and utilities.

Endorsed by Public Utility and Cooking School teachers for simplified and efficient cooking.

This ideal control for table-top ranges is another advance step. Easily and quickly mounted back of switch panel—or in back of oven with remote control.

Accurate temperature indicating pointer—single or double pole—and typical "Diamond H" construction.

Write for details and specifications.

DIAMOND H SWITCHES

The Hart Manufacturing Company

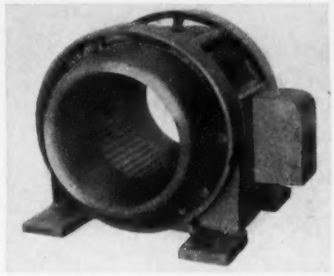
Hartford, Connecticut

pump units are available in capacities from 10 to 250 g.p.m. and for heads up to 190 ft., with motor rates from ¾ to 10 hp., to meet the requirements of a wide range of applications.

•

Sealed Static Coils

"Seal-clad" squirrel-cage motors of open type construction, with permanent coil protection, have been announced by the Allis-Chalmers Manufacturing Com-



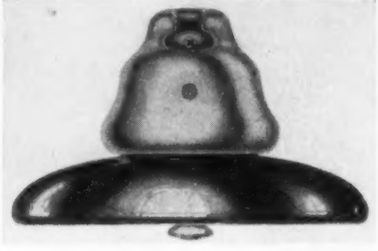
Allis-Chalmers

pany, Milwaukee, Wis. Hard, smooth, bakelite shields are sealed over the stator coils, giving protection against metallic dust, grit, oil, moisture, mild acids and other agents injurious to insulation. They are built in ratings up to 25 hp., 1,800 r.p.m.

•

More Insulator Strength

Improvements made in the mechanical characteristics of O-B suspension insulators have been announced by the Ohio Brass Company, Mansfield, Ohio. Eleven units comprise the line of these improved O-B suspension insulators. Three small units of 6 and 7½-in. diameters having M & E ratings of 8,000, 10,000 and 15,000 lb. respectively are available for distribu-



Ohio Brass

tion and special work; four types of 10-in. suspension insulators having M & E ratings of 15,000 lb. are also available in section lengths of 5, 5⅜ and 5¾ in.; for heavy dead-ending or similar purposes two improved O-B units of 10-in. diameter, with M & E ratings of 25,000 lb., may be secured. The line is completed by a still heavier unit of 12-in. diameter having an M & E rating of 36,000 lb.

•

EXPANSION BOLT. known as the "Rawl-Drive," has been placed on the market by the Rawlplug Company, Inc., New

IF THE *Telephone* WERE NOT THERE!

MANY times each day you reach for the telephone on your desk at the office or in its familiar spot at home. It is an old and trusted friend. You scarcely give a thought to what it means to a busy day.

Yet suppose the telephone were not there! Suppose—for a week—or a month—you could not call anybody by telephone and nobody could call you!

The whole machinery of business and the home would be thrown out of gear. Orders would be lost—efficiency and profits reduced. You would be out of touch with the world about you.

America needs quick, reliable telephone service to get things done in the brisk, crisp American manner. And it enjoys the best service in the world.

Greater progress has been made in this country because of the Bell System's one policy, one system and universal service.

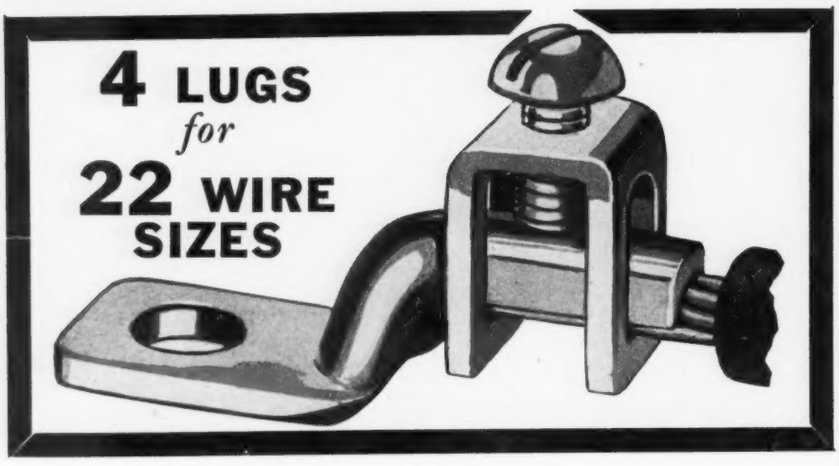
America leads in telephone service. In relation to population there are six times as many telephones in this country as in Europe and the telephone is used nine times as much.

BELL TELEPHONE SYSTEM

New

Reliable

SOLDERLESS LUG



• The four sizes take care of wire from No. 10 to No. 4/0 B. & S. They run cool and make uniformly dependable joints. One piece. Low in cost. Easily installed. Won't vibrate loose.

Send for a Sample

Other Products: Solderless Connectors; Service Entrance Connectors; Splicing Sleeves; Cable Grips; Solderless Lugs; Ground Clamps; Telephone Protectors and Specialties.

RELIABLE ELECTRIC CO.

3145 Carroll Avenue — Chicago, Illinois

York. It is a one-piece device for holding or attaching anything to hard materials such as concrete, brick, stone and other solid masonry. It drives in like a nail, a single, one-piece, unit sheared longitudinally through the center; each side of the shear is deformed in opposite directions.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

Fabrication, specifications and applications of "Romex" non-metallic sheathed cable are in a new bulletin of General Cable Corporation, New York.

Allen-Bradley Company, Milwaukee, Wis., has begun issuing completely revised sheets for its catalog covering starters, switches, rheostats, regulators, contactors, etc.

Ilg Electric Ventilating Company, 2850 North Crawford Avenue, Chicago, has issued a small new condensed catalog of air conditioning, heating and ventilating equipment.

Hendrick Manufacturing Company, Carbondale, Pa., has issued a pamphlet detailing applications of "Mitco" open steel flooring, treads and armorgrids to power houses.

American Blower Corporation, Detroit, has just issued a bulletin which gives data on sizes and capacities of the new Ventura fan.

"Savings Effected by Bailey Boiler Meters" in specific cases are recorded in a 32-page bulletin No. 44 of the Bailey Meter Company, Cleveland.

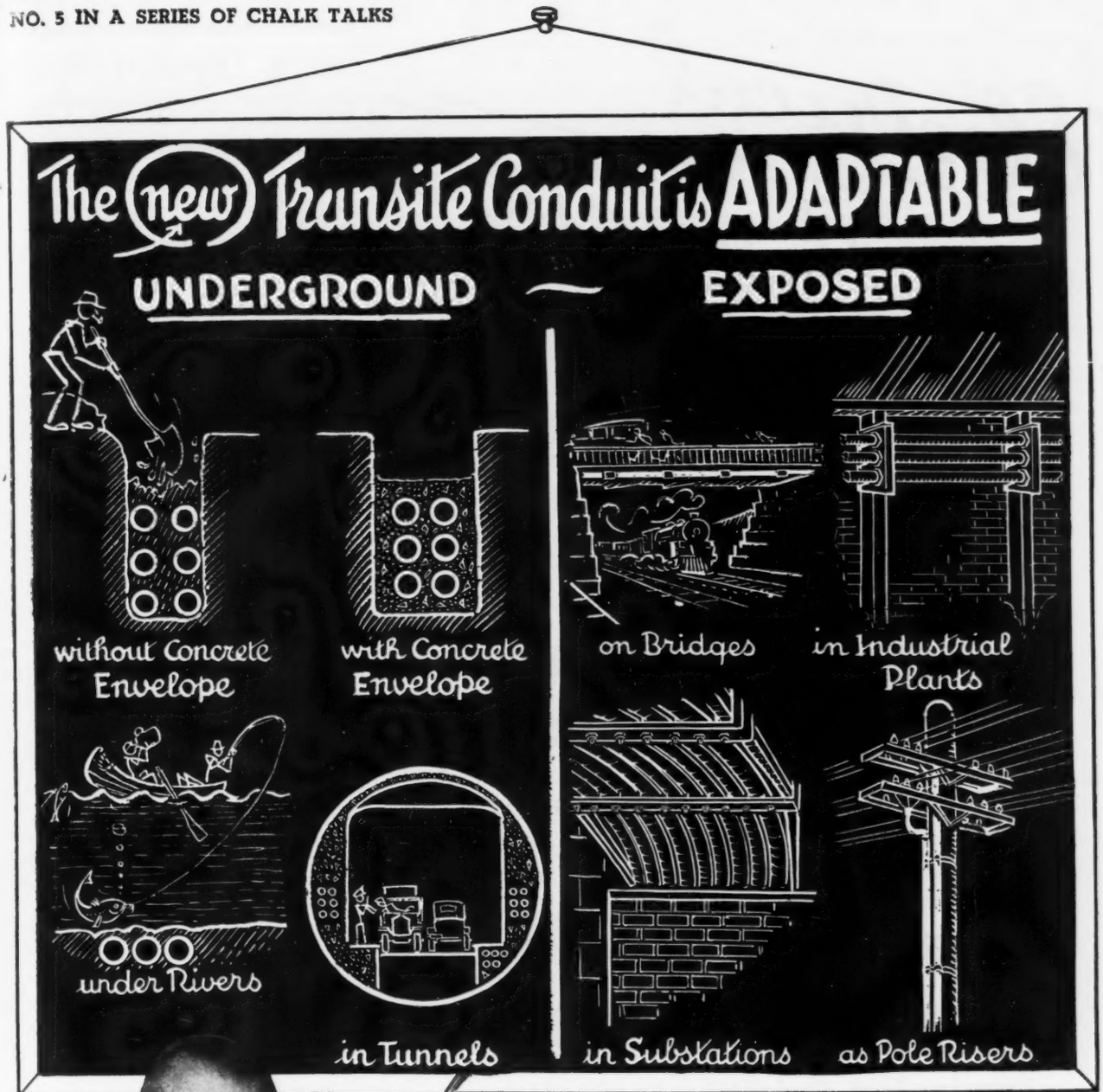
Crocker-Wheeler Electric Manufacturing Company, Ampere, N. J., has published a new bulletin "The Synchronous Motor of Today" (16 pages), giving structural details and applications.

"Industrial Cable" (GEA-1838, with 128 pages) gives full particulars of all General Electric Company varnish-cambric, rubber and asbestos cables and armored finishes, with engineering data on magnet wire and coils.

The Multiflex instantaneous reset timer of Eagle Signal Corporation, Moline, Ill., is described in function and application in new bulletin 232.

"Corrosion and Heat Resisting Steels" is a new engineering publication of Crucible Steel Company of America (Chrysler Building, New York), giving, in the 80 pages of its seven sections, the properties of chrome-nickel and chrome steels as to resistance to several hundred corrosive agents along with their working and fabricating properties. Turbine blading, power house and furnace uses are covered.

NO. 5 IN A SERIES OF CHALK TALKS



"... and here, briefly, are the characteristics that permit such great adaptability"

Strong . . . Withstands soil stress, earth load, all ordinary street traffic. *Permanent* . . . Highly resistant to soil corrosion, immune to electrolysis, absolutely weatherproof. *Incombustible* . . . Unharmed by smoke and corrosive fumes. Burnouts generate no smoke, fumes or combustible gases.

Furthermore, it has a low coefficient of friction; cables pull without damage . . . it has a high rate of heat dissipation . . . it is easily and economically installed. But get the full story. Write for the Transite Conduit brochure. Johns-Manville, 22 East 40th Street, New York City.

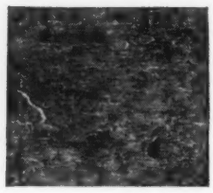
(Available only in the United States and Canada)

NRA

Johns-Manville TRANSITE CONDUIT

Electrical Insulations

PERFECT MICANITE INSULATOR REG. U.S. PAT. OFF.



Built-up Mica Insulations

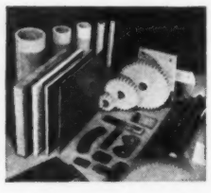
Plates, Segments, Rings, Tapes, Cloths, Tubes, Washers, Rope Paper and Mica, Fish Paper and Mica.

PERFECT EMPIRE INSULATOR REG. U.S. PAT. OFF.

Varnished Cloths and Papers

Varnished Cloth, Tapes (Seamless Bias or cut lengthwise), Silks, Papers, Canvas and Ducks, Cambric Tubing.

PERFECT LAMICOID REG. U.S. PAT. OFF.



Laminated Bakelite Insulations

Laminated Bakelite Sheets, Rods, Tubes, Fabricated Parts.

PERFECT MICO INSULATIONS

Insulations of other Types

Untreated Papers, Varnishes, Linen and Silk Tapes. Fibre, Spaghetti Tubing, Cotton Sleeving, Raw Mica, etc.

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200 Varick Street, New York, N. Y.; 542 So. Dearborn Street, Chicago, Ill.; 1330 Schofield Building, Cleveland. **Branches at** ***Birmingham, Boston, Cincinnati, Los Angeles, San Francisco, Seattle.*** **Canada:** ***Montreal, Toronto.***

SALES OPPORTUNITIES IN NEW CONSTRUCTION

CHATTANOOGA, TENN.—Tennessee Electric Power Company has authorized fund of $1,300,000 for extensions and improvements in 1935, including generating plants, power substations, transmission and distributing lines, with installation of new equipment.

KALAMAZOO, MICH.—Sutherland Paper Company plans installation of motors and controls, conveyors and other equipment in new multi-story addition to paper mill. Cost over $100,000.

LOS ANGELES, CALIF.—Wehle Brewing Company, New Haven, Conn., plans new multi-unit brewing plant on site now being selected at Los Angeles, with equipment for initial capacity of 150,000 barrels per annum; a power house will be built. Cost over $200,000, with machinery. A similar brewery is also projected at San Francisco, Calif.

DENVER, COLO.—Bureau of Reclamation, Denver, asks bids until January 11 for large quantities of insulated wire and cable (Circular 643-D).

LAMONI, IOWA—Asks bids until January 8 for two Diesel engine-generating units and auxiliary equipment for new city-owned electric light and power plant. Fund of $100,000 has been arranged. Young & Stanley, Inc., Muscatine, Iowa, is consulting engineer.

LOUISVILLE, KY.—Louisville Gas & Electric Company plans transmission line in Pewee Valley district, with power substation facilities for electric light and power service. Franchise has been asked.

AMBRIDGE, PA.—Sprang, Chalfant & Company, Inc., Pittsburgh, Pa., plans installation of heavy-duty motors and controls, regulators, conveyors, hoists, etc., in new addition to seamless steel tube manufacturing plant at Ambridge. Cost close to $150,000.

CHICAGO, ILL.—Standard Gas & Electric Company is arranging fund of $7,157,400 for new construction, expansion and improvements in electric properties in 1935, including power plant additions and betterments, power substations and equipment, transmission and distributing lines, and miscellaneous work.

MARSHALL, MO.—Plans extensions and improvements in city-owned electric light and power plant, including installation of new turbine unit and accessories, boilers and other steam power equipment, and betterments in distribution system. Proposed to ask bids soon. Burns & McDonnell Engineering Company, Kansas City, Mo., is consulting engineer.

KNOXVILLE, TENN.—Tennessee Valley Authority, Knoxville, asks bids until January 21 for service and emergency gates, gate tracks, guides and accessories for turbine inlets; bulkhead gates, gate guides and accessory equipment for draft tube outlets for Wheeler hydro-electric power plant.

DALLAS, TEX.—Pollock Paper & Box Company plans installation of motors and controls, conveyors and other equipment in new plant addition. Cost about $100,000, with machinery.

COLUMBUS, OHIO—Plans new city-owned electric light and power plant. Fund of $320,000 has been approved by PWA for project. Proposed to begin work soon.

HAWLEY, PA.—Fairplay Knitting Mills, Inc., plans installation of motors and controls, conveyors, etc., in connection with

WIDER HORIZONS

THE rural community — the classic "small town" of Lewis, Tarkington and Twain—faces a new future. Electric service and all that electric power and light mean to home life, commercial stimulation and industrial development, have carried urban advantages and opportunities throughout the countryside.

The small community supplied from integrated, interconnected electric transmission systems today has the ability to invite and foster the development of a healthy industrial life. It has the ability, by virtue of adequate electric resources, to capitalize the opportunities presented by trends toward industrial decentralization. With an electric service which, in its character, quality and reliability, compares favorably with the largest centers, these communities have the opportunity to benefit from industrial expansion or the changes arising from economic shifts.

No overnight outgrowth this—but the resultant of long years of plans and policies devoted to these aims; studied, measured, weighed, engineered for permanence, stability, adequacy and economy.

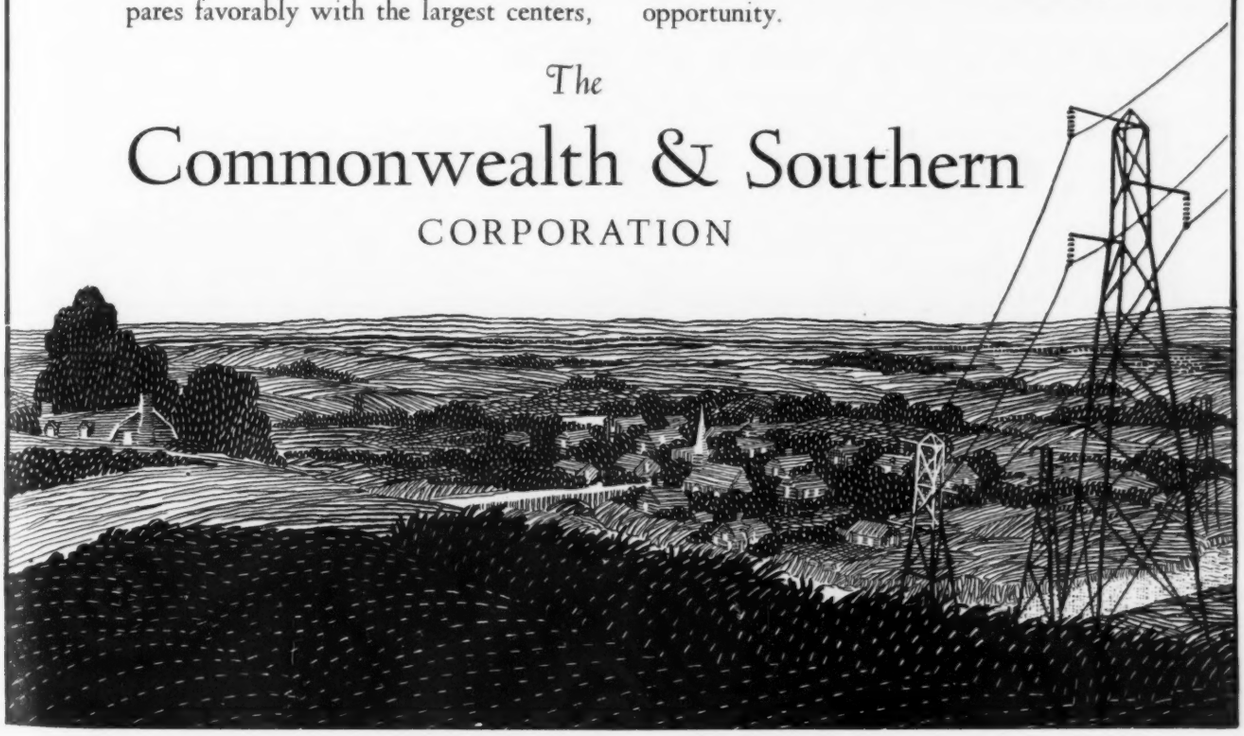
The human and social values of these contributions to American progress far outweigh the intrinsic price of electricity, consistently lower though its course has been.

The country has "come to town"—electric power and light has improved living conditions, cast off the shackles of older, costlier methods, lifted burdens of human toil and widened the horizon of commercial, industrial and community opportunity.

The

Commonwealth & Southern

CORPORATION



CRESCENT MAKES A COMPLETE LINE OF

SIGNAL CABLES	PARKWAY CABLES
CONTROL CABLES	FLEXIBLE CORDS
LEAD COVERED	WEATHERPROOF WIRE
VARNISHED CAMBRIC	MAGNET WIRE

and all kinds of Special Cables to meet A.S.T.M., A.R.A., all R.R., Gov't and Utility Co's specs.

NEW CATALOG WITH MUCH VALUABLE ENGINEERING DATA NOW BEING ISSUED

TEAR OFF AND MAIL THIS COUPON

CRESCENT INSULATED WIRE & CABLE CO. INC.
TRENTON, NEW JERSEY

Gentlemen: Please send me your new catalog

NAME .....

ADDRESS .....

rebuilding of plant recently destroyed by fire. Loss about $100,000.

BUFFALO, N. Y.—Bethlehem Steel Corporation, South Bethlehem, Pa., plans installation of heavy-duty motors and controls, conveyors, electric hoists and other electrical equipment in new sheet mill at Lackawanna plant, Buffalo. Cost $9,000,000.

TORONTO, ONT.—Ontario Hydro-Electric Power Commission is considering new hydro-electric generating plant at Lake St. Joseph, to be used for power service in mining districts. Cost over $350,000, with transmission line. Plans have been approved for new power substation at Timmins for power supply for gold mining properties in that section. Cost about $125,000.

BROOKLYN, N. Y. — Signal Supply Officer, Army Base, asks bids until January 14 for 11,200 feet cable and seven reels (Circular 65).

MARYVILLE, MO. — Imperial Brewing Company, Kansas City, Mo., is considering new multi-unit brewing plant at Maryville, where site is being secured. Cost over $100,000.

SAN FRANCISCO, CALIF.—George Caswell Company, 442 Second Street, plan installation of motors and controls, conveyors, electric hoists, loaders, etc., in new multi-story food products plant. Cost about $150,000.

UNION, S. C. — Lyles Ford Tri-County Authority, Union, L. G. Young, Union, chairman, plans hydro-electric power development on Enoree and Tyger Rivers, in vicinity of Lyles Ford, in connection with large irrigation project. Plant will have initial capacity of 54,000 hp., and will include transmission lines, power substations and switching stations. Fund of $8,500,000 is being arranged through Federal aid.

POTOSI, WIS. — Interstate Power Company, Dubuque, Iowa, has concluded agreement for purchase of municipal electric light and power plant at Potosi, and will furnish service here in future. Plant will be remodeled and equipped for distribution substation, with construction of new transsion line connecting with company high-tension system.

CEDAR FALLS, IOWA—Plans construction of transmission lines in vicinity of Winslow and Finchford, Iowa, about 8 miles, for light and power service in these communities from city-owned power plant. Application for permission has been made.

DECATUR, ALA.—Has authorized plans for city-owned electrical distribution system, with power substation and service facilities. Proposed to begin work early in 1935. Cost about $268,000. Financing has been arranged through Federal aid.

YUKON, OKLA.—Dobry Flour Mills, Inc., recently organized, T. A. Dobry, Yukon, president, plans installation of motors and controls, conveyors, elevators and other equipment in new multi-story flour and grain mill. Cost about $400,000.

WESTMINSTER, CALIF. — Westminster Chamber of Commerce is at head of project to establish new lighting district at Westminster and New Westminster. Will make surveys and estimates of cost at once.

RICHBURG, S. C. — Southern Public Utilities Company, Charlotte, N. C., has authorized extensions in 6,600-volt transmission line from Richburg to Pleasant Grove, Rodman and vicinity, about 9 miles, for electric light and power service in that district.

CAP DE LA MADELEINE, QUE.—Associated Textiles of Canada, Ltd., Louiseville, Que., plans installation of motors and controls, transformer equipment, conveyors, etc., in proposed new silk mill at Cap de la Madeleine, where large tract of land is being secured. A power house will be built. Cost close to $400,000.